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BAY AREA SOLID WASTE MANAGEMENT IMPLEMENTATION PROJECT. VOLUME I. PROJECT REPORT

Association of Bay Area Governments

Prepared for:

Environmental Protection Agency

December 1973

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This document is Volume I of a three-part report to ABAG. This report documents the planning conducted for the Bay Delta Resource Recovery Demonstration project. This proposed project would demonstrate recovery of resources from urban wastes and the use of composted refuse for island reclamation in the Sacramento-San Joaquin Delta. The report presents original research on the use of compost as a levee strengthening material and documents the planning for an intergovernmental structure to manage the demonstration, and serve as a first step towards eventual regional management of solid wastes. The report is published in three volumes, as follows:

Vol. I:	Project Report
Vol. II:	Environmental Evaluation for the Bay Delta Resource Recovery Demonstration Project
Vol. III:	Technical Report on Levee Stabilization and Composting

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BAY AREA
SOLID WASTE MANAGEMENT
IMPLEMENTATION PROJECT

VOLUME I

PROJECT REPORT

A Report Prepared for the Action Committee for
the Bay Delta Resource Recovery Demonstration
and the Association of Bay Area Governments

December 1973 by

ENVIRONMENTAL IMPACT
PLANNING CORPORATION
SAN FRANCISCO, CALIF.

eip

In association with Frank Stead

ABAG ASSOCIATION OF BAY AREA GOVERNMENTS

The preparation of this report was financed in part through a Solid Waste Demonstration and Resource Recovery System Grant from the Environmental Protection Agency, under the provisions of Section 204 of the Solid Waste Disposal Act as amended.

Environmental
Planning [illegible]

December 14, 1973

Mr. Revan A. F. Tranter
Executive Director
Association of Bay Area Governments
Claremont Hotel
Berkeley, California 94705

Dear Mr. Tranter:

In the fall of 1972 a group of local agencies in the San Francisco Bay Area joined together in an attempt to initiate a Demonstration project to test the feasibility of using composted organic solid wastes in the low-lying islands of the Sacramento-San Joaquin Delta for levee stabilization, land building and agricultural purposes. These local agencies, calling themselves the Bay Delta Resource Recovery Action Committee, also sought to develop the intergovernmental institution necessary to manage this Demonstration project and perhaps to become the regional agency charged with solid waste management. This report documents the efforts of these local entities, acting voluntarily, to attempt to improve the technical and governmental mechanisms operating in the field of solid waste management today.

The report is presented in three volumes. Volume 1 describes the preliminary system design for the Demonstration project and looks at the concept of Bay-area wide implementation of the plan. It also details the possible institutional mechanisms necessary to implement the plan. Volume 2 is an environmental evaluation of the Demonstration project and is written in the format of an Environmental Impact Report. Volume 3 contains two technical reports upon which the preliminary system design was based. Part A is a study of the structural characteristics of compost and an evaluation of the feasibility of using compost as a levee strengthening material. This report, prepared by Drs. Duncan and Seed of the Engineering Department of the University of California, Berkeley, represents original research on this subject. Part B documents the preliminary compost experiment conducted by Dr. Samuel Hart at Davis, California, and includes recommended composting specifications for the Demonstration.

The consultants wish to thank the members of the Action Committee and its chairman, Councilman Fred Maggiora, for making this report possible. We would also like to thank the U.S. Army Corps of Engineers (San Francisco and Sacramento Districts), the

California Department of Water Resources, the Central Valley Regional Water Quality Control Board, and the California Water Resources Control Board for their valuable contributions. Further, we would like to thank the Sierra Club, the League of Women Voters and the San Francisco Planning and Urban Renewal Association, as well as the many public and private organizations and individuals who participated in this study.

Yours very truly,

Hans A. Feibusch, P.E. and Frank M. Stead

VOLUME I

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FOREWORD

For over two hundred years this country has operated under a "cowboy economy"--throwing its natural resources away after one-time use. Now, as we consume more and more of these resources we are beginning to see the bottom of the barrel, not only for metals, minerals and wood products, but for fossil fuels as well. So we now find ourselves in danger of running out of both materials of manufacture and construction and sources of fuel. Our response has been to look at solid wastes as a new kind of ore and a new kind of fuel, and this is unquestionably a great step forward.

But at the same time we have been steadily "consuming" our most important resource of all--topsoil--the very basis of the support system for plant and animal life without which man cannot exist. We ship huge crops of vegetable foods and plant-fed animals to cities. Most of these organic materials taken from the soil are never put back. In addition, we allow wind and water to erode away topsoil, we cover it over with highways and cities, and we strip it away to more easily get at large deposits of coal and other mineral resources.

The natural replacement of lost topsoil is amazingly slow. Nature takes from 500 to 1,000 years to make one inch of topsoil. Our deepest concern, therefore, should be to halt, or at least slow down, this steady depletion of the country's soil mantle.

In the Bay Area nearly ten million tons of solid wastes are generated each year. Bay Area wastes that are collected are hauled by truck for burial in soil-covered disposal sites. Some sites are well engineered and operated so as to prevent health hazards, nuisance, and water pollution, but many are not. At the same time, at the north end of San Francisco Bay, where the Sacramento and San Joaquin Rivers merge, a delta of numerous scattered islands of peat exists. The Delta islands were diked against water intrusion during the early part of the century and include 500,000 acres of intensively cultivated agricultural lands. However, the islands have been sinking at the rate of two to three inches per year and are now ten to fifteen feet below sea level. Many of the dikes are weak and subject to frequent rupture as occurred dramatically in June 1972, when Andrus and Brannan Islands were inundated. If this situation is allowed to continue, loss of most of these valuable agricultural lands is virtually assured.

Several years ago the San Francisco Planning and Urban Renewal Association (SPUR), after a two-year study, proposed a mutual solution to the solid waste and Delta land subsidence problems. A pilot-scale Demonstration project was recommended to test this proposal (The Bay Delta Resource Recovery Demonstration).

The Demonstration is dedicated to the long range goal of returning to the land the materials from which topsoil is made--namely, the humus produced by bacterial decomposition of plant and animal residues. It would convert the organic portion of municipal refuse into a compost closely resembling natural peat soil. Compared to the conversion of solid wastes into combustible fuel supplies by incineration or pyrolysis, composting is a form of energy recovery occurring in the biological realm. The energy of organic materials in compost supports microbial action which efficiently stores and releases nutrients in the soil.

The peat islands of the Sacramento-San Joaquin Delta were selected as the site for the Demonstration because they illustrate an extreme case of topsoil erosion--caused in this case by the combined effects of wind and auto-oxidation. The islands also afford an unprecedented opportunity to compare directly the fertility of manmade topsoil with highly fertile natural Delta peat.

Because the Delta islands are in imminent danger of extinction by flooding, the first placement of compost will be in the form of a wide berm to physically buttress the levees. Later phases envision application of compost to the entire floors of the islands.

The vast agricultural area of the Delta has the capacity to assimilate the entire output of organic materials from the San Francisco Bay Metropolitan Region on a perpetual basis. Thus, the Bay-Delta Demonstration may well be the harbinger of a truly revolutionary change. We can perhaps turn from a system which diminishes our natural resources and increases our mountains of waste to a system in which the most valuable resource of all--the land--is preserved in undiminished productivity forever.

I. SUMMARY AND CONCLUSIONS

A. INTRODUCTION

This project has as its base the 1971 Report of the San Francisco Planning and Urban Renewal Association entitled "A Solid Wastes Management System for the Bay Region." Commonly known as the Bay Delta Plan. that report called for regional management of solid wastes; a maximum recovery of resources from the solid wastes stream; and a proposal to use the organic portion of municipal refuse for island reclamation in the Sacramento-San Joaquin Delta.

A three-phase program toward regional solid waste management was recommended. In Phase I, the planning would occur for a pilot scale Demonstration to test the concept of separating wastes and transporting the composted organic portion to the Delta islands. An intergovernmental structure would be formed to secure funding for and to manage the Demonstration project. In Phase II the Demonstration would be conducted, and in Phase III the Bay Area could move into permanent, full-scale operation of a regional plan.

Two years of effort by a few dedicated public officials and private citizens resulted in the formation of the Action Committee for the Bay Delta Resource Recovery Demonstration under the sponsorship of the Association of Bay Area Governments (ABAG) to carry out Phase I. The Action Committee developed into a diverse and dynamic coalition of elected officials, public administrators, engineers and concerned citizens representing large and small cities, rural and metropolitan areas, utilities and the private sector of the solid wastes industry.

Although such a broad range of interest often results in cautious progress, it is certainly the most deliberate and responsible way to proceed in planning for any regional solid waste management program.

The planning study focused on three basic areas. First, intergovernmental arrangements were explored to manage the Demonstration project on behalf of the political jurisdictions of the Bay Area. It was thought that these arrangements might serve as a first step to regional cooperation and eventual regional management of solid waste. Second, a preliminary system design was developed for the Demonstration including selection of participants, design of a monitoring program, economic analysis and an environmental evaluation. Finally, the concept of full-scale implementation of the plan in the Bay Area was investigated in terms of its costs and technical, environmental and political feasibility.

The results of this study suggest a number of areas of concern. The formation of an intergovernmental agency to manage the Demonstration has been slow and continued efforts will be required to achieve a final welding of this institution. Feasibility studies indicate that placement of compost behind Delta levees may cause cracking of the levees, and leachates from the compost may have adverse effects on water quality and wildlife in the Delta sloughs. Also, full-scale implementation of the project is likely to result in a high per mile cost of buttressed levee. However, no obstacles have been identified which seem to be insurmountable and it is clear that a pilot scale Demonstration project offers the best opportunity to answer the questions which have been raised. In view of the exciting potential of this program for solving a major portion of the solid waste disposal problem and for contributing to the stabilization of Delta levees, the pilot scale Demonstration should proceed as rapidly as possible in order to test the validity of this plan.

B. REGIONAL SOLID WASTE MANAGEMENT

According to the SPUR report, an essential element of the plan includes the management of solid wastes on a regioal basis. Only on a region-wide basis can a resource recovery plants of economical size be developed and efficient transportation routes be established. Perhaps most importantly, only on a regional basis can the intergovernmental agreements be developed which are necessary for large scale land reclamation in the Delta.

A regional waste management plan should be carried out in accordance with the following principles:

a. A new governmental entity is needed to carry out a region-wide wastes management program for the Bay Area.

b. To the greatest extent feasible, private enterprise should be encouraged to undertake all aspects of solid wastes management--collection, resource recovery and disposal.

c. Inventive proposals to carry out aspects of the regional plan should be encouraged, and should be evaluated on the basis of their conformity to the regional plan.

An intergovernmental entity is needed for regional management of solid wastes for the following reasons:

a. to manage demonstration projects that would have region-wide application;

b. to solicit and accept funding from state, federal and other sources;

c. to allocate costs fairly among local jurisdictions;

d. to plan comprehensively, including transportation and land use as well as waste processing and disposal;

e. to facilitate inter-county transfers of waste materials;

f. to make a systems approach to resource recovery more feasible;

g. and finally, to eliminate the need for direct federal and state controls.

An ultimate regional solid wastes management entity, regardless of its form, should have the following powers and duties:

a. to arrange for the processing of the region's solid wastes;

b. to arrange for the building or leasing of a system of regional processing/transfer stations and transport systems;

c. to set fees sufficient to be self-supporting (which would include the costs of processing and conversion of solid wastes, less income from sales of reclaimed material);

d. to regulate the selling of all recovered materials on the basis of long-term, competitive bids (recognizing that in some cases private processers will pay for wastes to be recycled, and in other cases the public agency may have to pay them to take the wastes);

e. to regulate the processing of all toxic and special wastes so as to recover as much reusable material as possible and also to minimize the toxicity of the residues, and then to dispose of such residues in specially approved sites under rigidly enforced conditions to protect public health;

f. to require that all independent management of wastes (i.e., all wastes not entering the regional management system) meet standards established to protect public health and the environment;

g. to set standards for the manner in which waste materials are to be delivered to the processing/transfer stations after collection from homes, businesses and factories;

h. to encourage and support research and demonstration programs designed to process and recover resources from waste materials in the most efficient manner and at the lowest cost consistent with standards of environmental protection and resource conservation.

Regional management of solid wastes can be implemented by a governmental entity taking any of the following forms:

a. A multi-purpose, limited function, regional government could be created for the Bay Area and given, as one of its assignments, responsibility for carrying out the wastes management plan.

b. A single-purpose regional agency (such as the Bay Area Sewer Service Agency) could be created by the California Legislature.

c. A special wastes management and refuse disposal district encompassing Bay Area counties could be created pursuant to State laws governing either municipal utility or sanitary districts.

d. A regional agency could be established by existing public bodies pursuant to the State Joint Exercise of Powers Act.

Each of these alternatives has its own advantages and disadvantages and what is likely to develop in the future is difficult to predict. Each of these possibilities and several others were reviewed by the Action Committee in their search for an intergovernmental structure to manage the Demonstration.

C. THE BAY DELTA RESOURCE RECOVERY DEMONSTRATION PROJECT

1. Objectives

A major objective of the Demonstration is to test the feasibility of a regional solid waste management system that would simultaneously recover resources from urban wastes and provide for land reclamation in the Sacramento-San Joaquin Delta. Specific project objectives are:

a. to demonstrate regional cooperation in conducting a solid waste demonstration project;

b. to demonstrate the technical and economic feasibility of recovery of resources from solid wastes;

c. to determine the engineering feasibility of levee reinforcement with composted urban refuse;

d. to demonstrate the agricultural worth of new soil built from composted refuse;

e. to determine the environmental effects, especially on air and water, of placing compost on a Delta island.

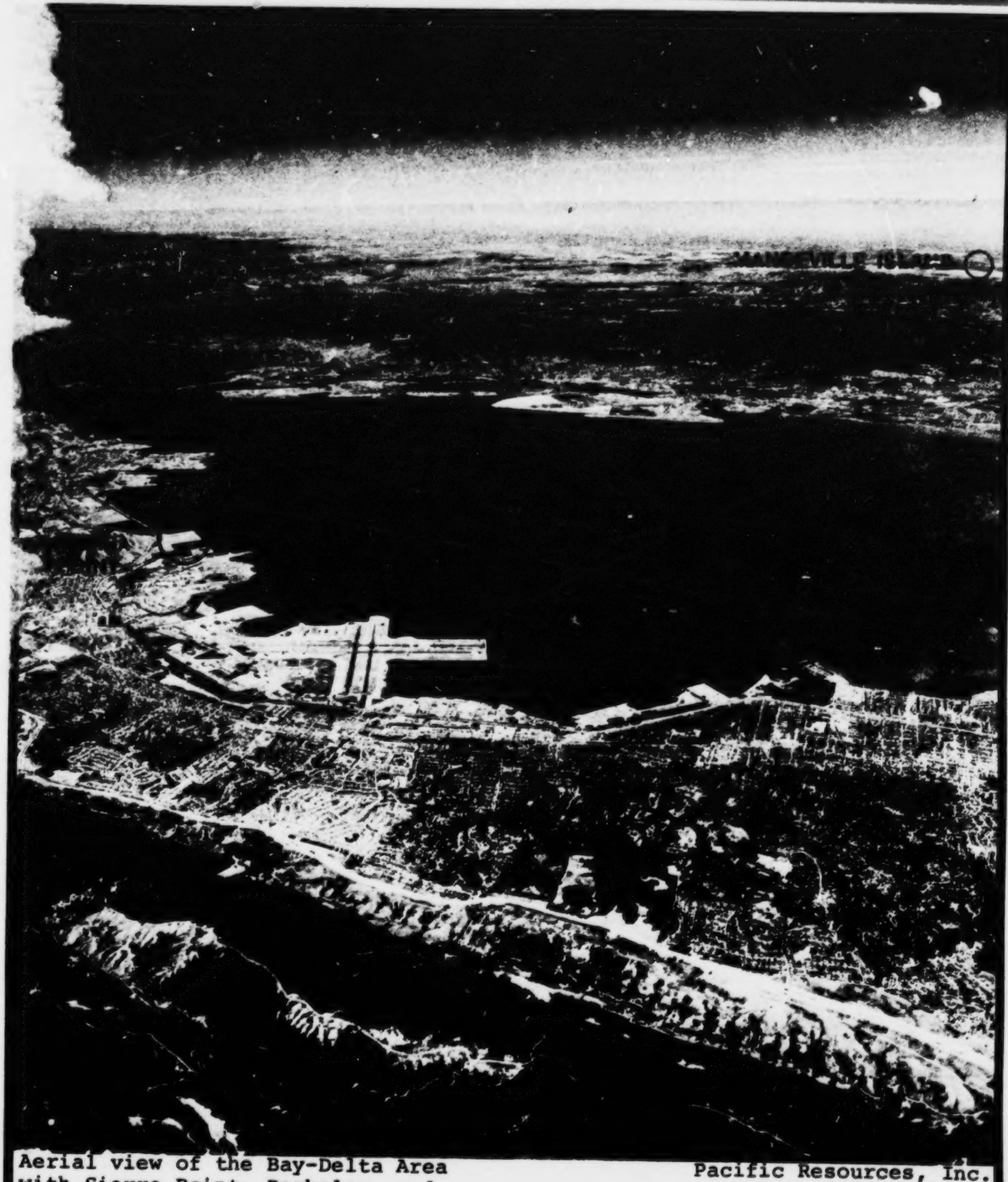
2. Operational Description

The Demonstration would be conducted over a two-year period, processing municipal refuse and sewage sludge in Berkeley and San Francisco.

In Berkeley, 200 tons per day of municipal refuse would be delivered to a transfer station for shredding, air classification and magnetic separation of ferrous metals. The light organic fraction would then be transported to a composting site located at the Berkeley landfill. Partially dewatered, digested sewage sludge from the East Bay Municipal Utility District would be mixed with the refuse in a windrow composting operation.

In San Francisco, residential refuse delivered to the existing transfer station would be shredded and air classified for recovery of metals and possibly glass; 150 tons per day of the light organic fraction of this refuse would be delivered to a composting site on land owned by the Sanitary Fill Company at Sierra Point in South San Francisco. Digested sewage sludge would be delivered to the composting plant from San Francisco's Southeast Sewage Treatment plant.

At each site, composting would be accomplished in long windrows or piles which are turned, aerated and moistened every few days to maintain aerobic (presence of oxygen) conditions. Composting would occur for approximately 21 days. The material would then be screened to remove plastic film and oversize particles.

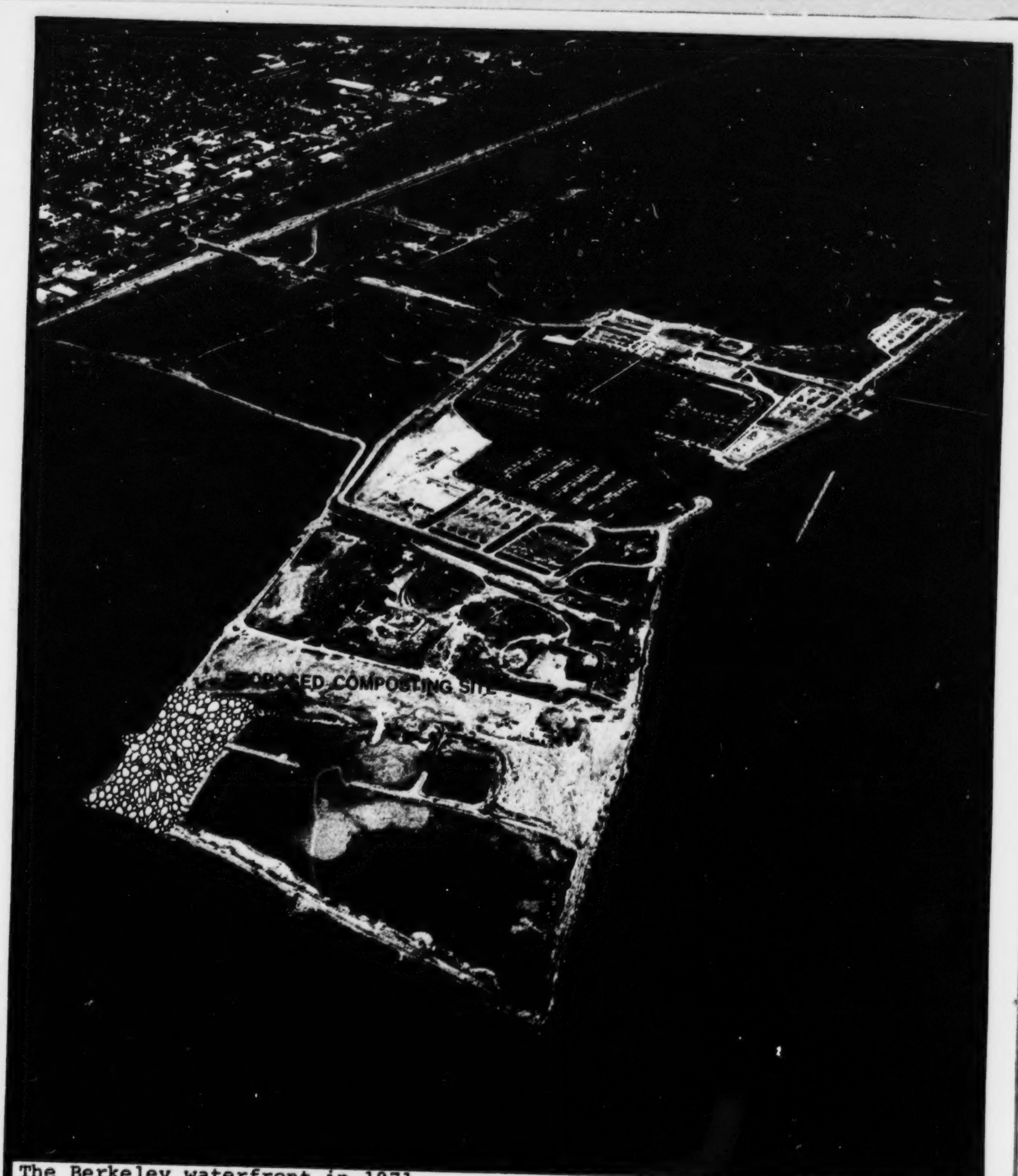


Aerial view of the Bay-Delta Area
with Sierra Point, Berkeley, and
Mandeville Island indicated.

Pacific Resources, Inc.

ABAG ASSOCIATION OF BAY AREA GOVERNMENTS

Bay Delta Resource Recovery Demonstration Project


PROPOSED COMPOSTING SITE

The Berkeley waterfront in 1971
with proposed composting site in foreground.

Pacific Resources, Inc.

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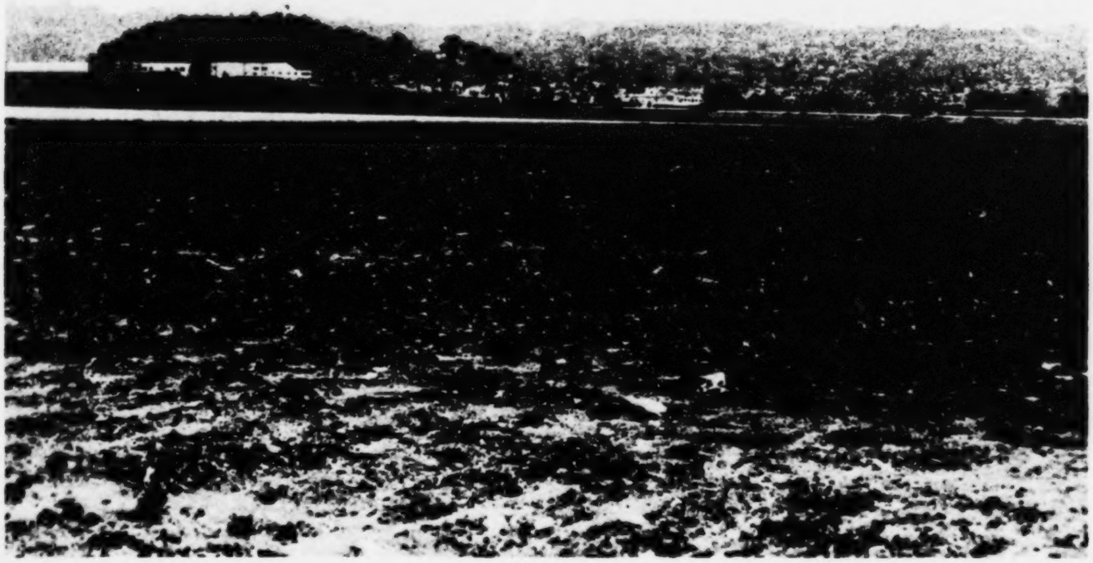

The Berkeley composting site - Albany Hill and Berkeley hills in background.

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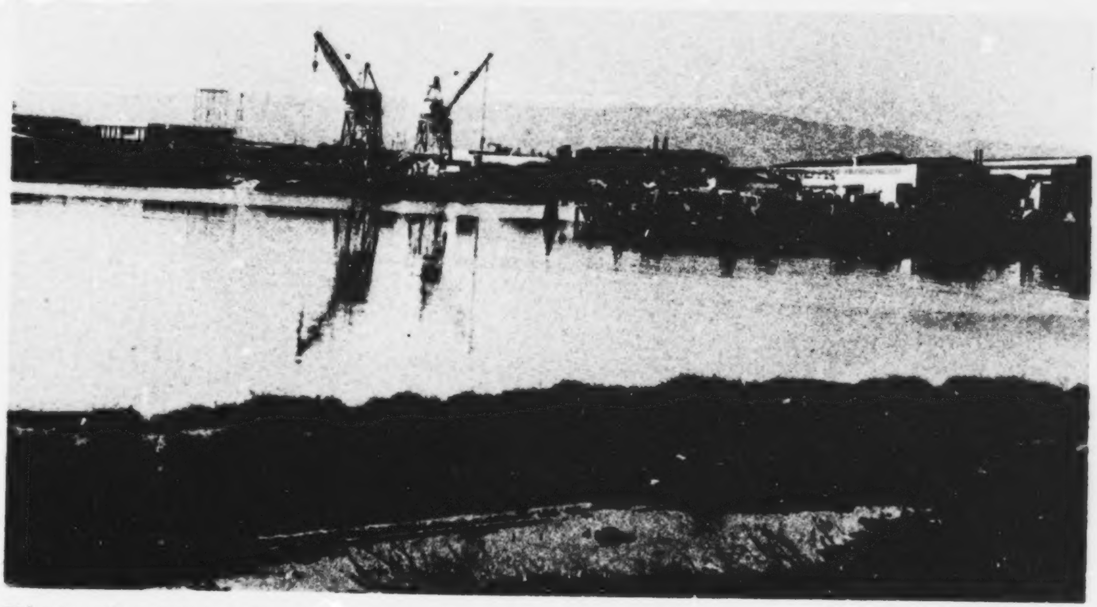
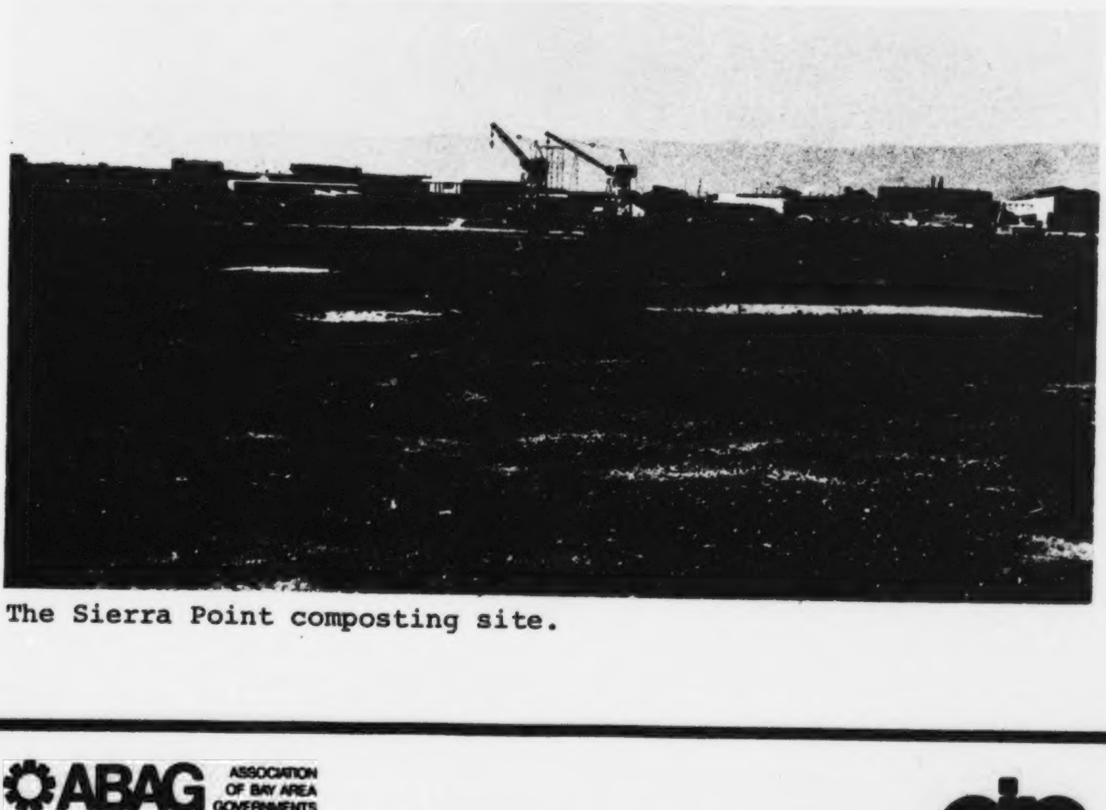


View of waterway adjacent to Sierra Point.



The Sierra Point composting site.

About 100 tons of compost per day would be produced at each site for a total of 1,000 tons per week.

At each site, the compost would be loaded onto a barge docked in the adjacent waterway and shipped at weekly intervals to Mandeville Island in the Sacramento-San Joaquin Delta. The barges would be unloaded by a crane and compost would be placed behind an 1,800 foot stretch of levee in a berm extending up to 500 feet inland. This berm would be built up slowly over a two-year period to prevent excessive compression of the peat resulting from high loading rates that might weaken the levee. Monitoring of air quality, water quality, soil stability, agricultural productivity and biotic effects would be conducted to determine if large scale application of compost could be accomplished without environmental impairment to the Delta. Knowledge would also be gained about the extent of composting required, materials handling techniques and levee reinforcement procedures that could be applied to a full-scale operation.

3. Governmental Structure

The Demonstration project would be managed by an intergovernmental structure representing jurisdictions of the Bay Delta area.

For the purposes of the Demonstration, only a few of the functions of a regional solid waste management entity described in Section B need be served by the selected intergovernmental structure. These include:

a. the ability to manage the Demonstration project;

b. the ability to solicit and accept funding from state and federal sources;

c. the ability to fairly allocate the regional share of costs over local jurisdictions.

Several intergovernmental structures emerge as possible forms to manage the Bay Delta Resource Recovery Demonstration Project. The first involves the establishment of a Joint Exercise of Powers Agency consisting of all the counties of the Bay Delta region. The directors of the Agency could be elected officials of the constituent units, or they could be persons chosen by these units of government, either laymen or local officials such as public works directors. The second possibility is that Association of Bay Area Governments (ABAG) expand its traditional role of advisory planning to assume stewardship of the Demonstration project. The third is that a Joint Exercise of Powers Agency be formed among Bay Delta counties which would contract with ABAG for administrative services. And finally, a memorandum of agreement between ABAG and the Sacramento and San Joaquin Councils of Government could be formed.

Each of these alternatives would satisfy the requirements of the Demonstration and is suitable for transformation into the solid waste management arm of a possible future regional organization.

As of the date of this report the Action Committee has reconstituted itself as a Joint Powers Agency to pursue funding for the Demonstration. However, this Agency is only an interim agreement until an agency to manage the Demonstration can be established. The formation of this latter agency will require continued efforts by the new Joint Powers Agency in the months ahead.

4. Economic Analysis and Proposed Funding

The estimated cost of conducting the Demonstration is $6.9 million as shown in the table on the following page:

	(A) Capital Costs	(B) Annual Operating Costs	(C)=(A)+2(B) Total Cost
Processing/Transfer Station	253,000	162,000	577,000
Composting	2,250,000	692,000	3,634,000
Barge transport	500,000	545,000	1,590,000
Compost placement	110,000	200,000	510,000
Monitoring	54,000	170,000	394,000
Project supervision		50,000	100,000
Other	25,000	25,000	75,000
Total	$3,192,000	$1,844,000	$6,880,000

As the benefits of the Demonstration accrue to regional, state and federal interests, it is proposed that funding be divided among these levels of government. The recommended percentage cost allocation is 10% regional, 40% state and 50% federal. (The rationale for this allocation is contained in Section IIIC.) It is recommended that the regional share be divided among all counties of the Bay Area on a pro rata population basis.

D. CONCEPT OF A FULL-SCALE SYSTEM

1. Transfer Stations and Resource Recovery

As public sentiment for resource recovery continues to mount, and as close in landfill sites around the perimeter of San Francisco Bay become unavailable for further dumping operations, more and more communities will need to develop transfer stations regardless of the ultimate disposition of the waste. The transfer station owned by the San Francisco scavenger companies is a prototype of this operation. Once the need for a transfer station is established, it is increasingly apparent that the recovery of metals and glass through shredding and mechanical separation is technically feasible and probably economically viable, given a sufficient quantity of refuse. A multitude of resource recovery systems adapted from mining and lumbering industries are currently under development or installation across the United States. Most of these systems are based on the principal of particle size reduction followed by ballistic separation of the light organic fraction of solid wastes from the heavy, largely inert fraction. Over the next decade it is likely that such systems will be installed within the Bay Area. The SPUR report projected a need for 16 such transfer stations although the exact number and location of these stations will depend upon many factors. The extent of resource recovery at these stations will depend more upon the market price for reclaimed materials than on the availability of the technology needed to produce them.

2. Composting

Composting technology has been extensively developed in both Europe and the United States. Many composting processes are available, ranging from enclosed digesters with automatic control of such factors as moisture and aeration, to windrow systems where organic wastes are piled in long rows and turned every few days by specially designed vehicles. An enclosed composting system will soon be demonstrated by the Delaware Reclamation Project in Wilmington, Delaware under an EPA grant. Enclosed systems may be impractical for the composting of 5-10,000 tons per day of organic wastes in the Bay Area. The largest systems which have been designed to date have a capacity of only 200-300 tons per day. Windrow composting was selected in the preliminary design for the Demonstration because it appears more feasible to scale up. The only limit to its capacity is the availability of land--a total of perhaps 300 acres would be needed to compost all the Bay Area's wastes. This could be accomplished on completed landfills or on marginal lands around the Bay Area. A key aim of the Demonstration is to determine the optimal composting process that would apply on a large scale.

Over the last 20 years American composting operations have largely been unsuccessful, not due to technological problems, but because of a lack of market for sale of the humus product. In contrast, the Bay-Delta plan has an automatic function for humus in the Delta. Its use would serve the general interest and would be supported by public payment if its value for levee stabilization and topsoil building can be demonstrated.

3. Transportation

Finished compost would be delivered to most islands in the Delta by barge. One thousand- and two thousand-ton capacity barges can be designed with special screw conveyors and elevators for efficient unloading at the destination island. The unloading operation could occur at a single point on an island or, conceivably, the barge could unload at various points around the island as sections of the levee berm were completed. A few islands in the Delta can also be reached by rail. The feasibility of rail haul would depend on locating the composting site near a rail line.

4. Levee Reinforcement

Studies conducted by Duncan and Seed[1] on the feasibility of stabilizing Delta levees with a compost berm indicate that both beneficial and detrimental effects could result. While it would provide increased stability on the landside slope of the levee, non-uniform settlement of the underlying peat could result in longitudinal cracking of the levee over a period of years. Settlement would also result in lowering the elevation of the levee tops causing some loss of "freeboard." Considering the need to eventually strengthen the levees by some means, the report concludes that constructing a berm adjacent to the levees appears to be the best method of strengthening them, and that compost has engineering properties suited for this task. The conclusions reached are based on a preliminary study and only carefully conducted field studies can provide definitive information on the suitability of compost as a levee strengthening material.

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[1] See Volume 3, Technical Report on Levee Stabilization and Composting.

5. Impact on Solid Waste Disposal

Full-scale operation of the plan could have a major impact on the quantity of solid wastes requiring disposal in the Bay Area. Solid wastes reaching disposal sites can be classified as follows:

Category	% of Total Disposal
Residential	35.7%
Commercial and public (including sewage sludge)	42.9
Construction and demolition	14.3
Industrial	7.1
	100.0%

If newspapers are sorted for recycling and residential and commercial wastes are processed for recovery of metals and glass and composting of the organic remainder, the estimated disposition of all wastes is as follows:

Item	% of Total Wastes
Compost (35% moisture)	40.0%
Recovered metals, glass and paper	10.0
Carbon dioxide and water lost	20.0
Residue for disposal	30.0
	100.0%

It is likely that not all commercial wastes are suitable for composting which would increase the amount of wastes requiring disposal. On the other hand, if residuals (plastics, rubber, leather and other combustibles) can be used for energy production or if construction debris can find a useful application, less wastes would require disposal. Thus, as a first approximation it appears that between 50% and 70% of the total solid waste disposal load of the Bay Area could be managed through resource recovery and composting for land reclamation. Because sewage sludge is generated relative to organic refuse in a proportion optimal for proper composting, all sewage sludge could be recycled in the process.

6. Impact on Levee Stabilization

Each year the repair of breeched levees becomes more problematical. Unless a permanent levee protection plan is soon developed, other islands may flood as have Frank's Tract, Big Break and the west end of Sherman Island, with irreparable loss of agricultural land and human settlements.

The quantity of solid wastes available in the Bay Area for conversion into levee reinforcing material appears to be sufficient to treat unstable levees at a moderate rate. According to the most recent figures from the State Department of Health, 5.7 million tons of solid wastes are disposed of in the Bay Delta Area annually. Of this total, it is estimated that 2.25 million tons of compost could be produced per year, enough to reinforce 5.5 miles of levee. This quantity of compost will increase, however, since annual solid waste generation is likely to keep growing and since agricultural wastes, which would roughly double the available supply of organic materials for composting may require disposal in the future.

About 200 miles of levee have been identified by the Corps of Engineers as being in some state of deterioration. At a rate of 5.5 miles of levee per year, about 36 years would be required to stabilize these levees. It would of course be prudent to begin with levees which are in the worst condition, and then proceed to those which are in less immediate need of care.

7. Environmental Effects

The Bay Delta plan offers an opportunity to alleviate adverse environmental effects resulting from both solid waste disposal operations and the subsidence of land in the Sacramento-San Joaquin Delta.

Solid wastes, including sewage sludge are in most cases unprocessed and dumped in landfills around the perimeter of the Bay. This results in a loss of recoverable resources and often a removal of wildlife habitat and impairment to the quality of waters surrounding the disposal site. The Bay Delta plan would at least cut in half the volume of wastes requiring conventional landfill.

In the Delta, the plan would offer an opportunity to strengthen weak sections of the levee, provide additional top soil for agriculture, and possibly reduce the amount of airborne peat dust. By preserving Delta levees, vast areas of highly valuable agricultural land would be protected, as well as the quality of Delta waters by avoiding the serious salt water intrusion from San Francisco which occurs when levees are breached.

The potential exists for environmental impairment, however. Thus a major reason for conducting the Demonstration is to monitor air quality, water quality, levee performance, agricultural productivity and biotic impacts.

In an environmental evaluation conducted for the Demonstration, several potential problems were identified. The most significant was the possible leaching of contaminants into Delta waters resulting in adverse impacts on wildlife and water quality. Although it may develop that some restrictions need to be placed on the kinds of refuse and sludge used, no findings have been uncovered indicating that unacceptable environmental impacts would occur. The ultimate environmental safeguard of the plan is that adverse environmental effects can be detected in the pilot-scale Demonstration before full-scale implementation ever occurs.

8. Projected Costs

A basic assumption underlying the Bay-Delta plan is that in the future, municipalities will be responsible for the conversion of solid wastes into useful and marketable products and for the disposal of the remaining residue. A higher level jursidiction, representing the broader public interest at the state and/or federal level would be responsible for the transportation and placement of compost in the Delta. Such an approach will be needed to achieve a fair division of economic responsibility among the parties that would benefit from this double-goaled program.

The local share of full-scale operation of the Bay Delta plan could range from $9-$12 per ton of refuse processed. This is considerably higher than the cost of local landfill operations which cost about $2-$4 per ton. However, estimates for the cost of regional sanitary landfills (requiring baling and long transportation hauls) have been offered from $7-$15 per ton. Thus, as close-in landfill sites become unavailable and as disposal operations are upgraded to true sanitary landfill requirements, it appears that the Bay-Delta plan could be an economically viable alternative to municipalities seeking new solutions to the solid waste management problem.

The Bay-Delta plan also involves the expense of transporting compost to the Delta and placement of the material behind levees. Preliminary estimates indicate that this could cost on the order of $7 per ton of compost applied. Assuming that 75 tons of compost would be needed per foot of levee treated, this cost is estimated to be $2.8 million per mile of levee treated. Using all of the organic wastes of the Bay Delta Area would result in the buttressing of at least 5.5 miles of levee annually at a cost of about $15 million.

These costs are estimated conservatively and they are based upon many assumptions whose validity cannot be determined until more conclusive results are obtained from the Demonstration. Even if these costs prevail, less expensive alternative proposals for buttressing levees with dredger spoils may prove infeasible for a variety of reasons. Dredger spoils are almost twice as dense as compacted compost and their weight may cause even greater cracking and settlement of levees than predicted for compost. Also, dredger spoils may not be obtainable from adjacent river channels due to permit restrictions. Barge haul from remote sources would increase costs considerably and may offer only random availability. In contrast, organic solid wastes are generated on a constant, predictable basis and would offer a permanent, dependable supply.

9. Political Feasibility

The major test of the viability of the Bay-Delta plan will probably not reside in its economic, environmental or technical feasibility, but in its political feasibility. Nearly unprecedented cooperation between local governments, Delta landowners, the refuse removal industry, and state and federal agencies must be achieved in order to make a sufficient quantity of compost available for preservation of the Sacramento-San Joaquin Delta. This political cooperation will ultimately be the essential ingredient required to convert an exciting idea with tremendous potential into an operating reality.

II. INTERGOVERNMENTAL ORGANIZATION

A. THE ACTION COMMITTEE

The Action Committee for the Bay Delta Resource Recovery Demonstration was organized in mid-1972 for the purpose of implementing Phase I of a regional solid waste plan presented by the San Francisco Planning and Urban Renewal Association (SPUR), in November 1971. That plan, often referred to as the Bay-Delta Plan, called for regional management of solid wastes, maximum recovery of resources from the solid waste stream, the use of composted Bay Area wastes for island reclamation in the Sacramento-San Joaquin Delta, and the rapid initiation of a pilot project to demonstrate these concepts. The SPUR report recommended the joining together of local agencies to pursue the plan.

Knowing that the Association of Bay Area Governments (ABAG) would be interested in this plan, SPUR had kept them informed of the project as its work went forward. When the SPUR report was published, there was an immediate positive response from the Executive Committee of ABAG, which formally endorsed the proposal. Shortly afterwards, ABAG's solid waste subcommittee set about contacting interested parties to form a group that could implement SPUR's proposed Demonstration project. By August 1972, an ad hoc steering committee for the Bay Delta Resources Recovery Demonstration had formed under the auspices of ABAG. Counties, cities and districts of the Bay Area were invited to join an "Action Committee" and to make a financial contribution to implement Phase I of the Demonstration ($1,500 for jurisdictions with populations under 50,000, $3,000 for jurisdictions with more than 50,000). By the end of 1972, there were 12 active, financially committed members of the Action Committee: the cities of Antioch, Berkeley, Livermore, Oakland, Pleasanton, San Leandro, San Francisco and Vallejo; Contra Costa and Marin

Counties; the East Bay Municipal Utilities District and the Central Contra Costa Sanitary District. (Other members continued to join the Action Committee during the course of the project and a complete list is presented at the front of this report.)

In November 1972, the Environmental Impact Planning Corporation in association with Mr. Frank Stead (original co-authors of the SPUR report) were retained as consultants to assist the Action Committee in its work.

At this point it was assumed that Phase I of the project, the planning stage, would be financed by the members' contributions and that the actual Demonstration, Phase II, would be financed by the United States Environmental Protection Agency's Solid Waste and Resource Recovery Demonstration Grants Program. In December 1972, the Action Committee learned that because of policy changes, the EPA would not fund the Demonstration itself, but was interested in supporting the formation of an intergovernmental agency in the Bay-Delta region with the capability of undertaking the SPUR/ABAG solid waste demonstration and possibly other regional solid waste management activities. The original scope of work of Phase I was revised to encompass and emphasize this concern, and a grant proposal was submitted to EPA. The EPA grant was approved and became effective February 15, 1973.

B. INVESTIGATION OF ALTERNATIVE INTERGOVERNMENTAL STRUCTURES

1. Contacts with Counties

In order to investigate appropriate structures to manage the Bay Delta Resource Recovery Demonstration, the Action Committee appointed an Intergovernmental Structure Subcommittee. The members of the subcommittee decided that as a first step they would establish contact with the people in the counties of the Bay Delta region with responsibility for county solid waste management planning, to inform them of the purpose and objectives of the Demonstration. California's recently enacted Solid Waste Management and Resource Recovery Act (Senate Bill 5) requires all counties in the state to prepare a Solid

Waste Management Plan by January 1, 1976. County plans are required to be consistent with any regional or subregional plans. Subsequently, presentations were offered to elected officials, staff and citizen groups at ten meetings in six counties.

Next, discussions began as to what sort of intergovernmental structure they should propose. In its search for the most suitable intergovernmental structure to raise the necessary funds and manage the Demonstration project, the subcommittee, aided by the consultants, gave consideration to a number of arrangements.

2. Alternative Governmental Structures

a. A multi-purpose regional government with waste management as one of its assigned responsibilities.

This is generally considered to be the most far-reaching intergovernmental arrangement. Such an agency, with taxing and bond-issuing powers, would be equipped to marshal the necessary funds and technical expertise to manage the Demonstration. Cost-sharing could be fairly easily arranged and transition from the Demonstration to a large-scale solid waste disposal plan would be simplified. The resulting consolidation of some existing regional and subregional agencies might be attractive to the private scavengers, since it could lead to reduced bureaucratic regulation. Most political scientists agree that solid waste planning must take place as part of a comprehensive planning process including such areas as land use and transportation. Many engineers interested in establishing efficient systems of solid waste management agree with this concept from a cost/effectiveness point of view. The establishment of a multi-purpose regional agency is an official ABAG goal, and the pending (1972) Knox Bill (AB2040) in the California Assembly would be a step in this direction.

However, this form of regional government is opposed by many as being ahead of its time. Under such an arrangement regional solutions could possibly be imposed upon unwilling local governments. In any case the establishment of such a regional agency would require lengthy legislative consideration. The subcommittee therefore agreed that the creation of regional government or any sort of multi-purpose agency was beyond its scope and powers.

b. A single-purpose regional agency created by state law.

Such an agency would be an efficient structure to concentrate on the Demonstration's work, and would be a good base from which to expand the Demonstration into an eventual, region-wide program. The legislature could structure it to assure local participation, and it could be given independent financing powers.

On the other hand, many feel that any additional single-purpose agencies would compound regional problems more than they would help. Many single-purpose agencies already exist with special, often conflicting and overlapping powers and jurisdictions. Only a tenuous relationship with comprehensive regional planning could be realized. The private sector opposes any additional "layers of government," and legislative approval of such an agency would certainly be difficult. ABAG is strongly opposed to this alternative.

c. A special waste management and disposal district established under existing state legislation governing municipal utility or sanitary districts.

This alternative's chief advantages are that establishment of such an organization would require no new state legislation and the fact that special districts have their own built-in taxing and bonding powers.

But the disadvantages are generally the same as those applying to the single-purpose regional agency--that is, too many special districts have already led to the fragmentation and unnecessary complexity of local services, making the task of coordinated regional planning very difficult. ABAG and the private sector both oppose the addition of any new such licensing or permit-issuing bodies. Formation of either a sanitary or a municipal utility district would require action before the local boards of supervisors and formation elections, another greatly complicating factor.

d. A regional agency established pursuant to the state Joint Exercise of Powers Act.

This alternative was recommended in the SPUR report. It offers the best prospect for a quick beginning, since it consists simply of a contractual agreement between entities. In such an arrangement, membership and management of the Demonstration would be entirely local and voluntary, and no participants would be forced into an agreement. On the other hand, this is a joint powers agreement's greatest drawback. Being entirely voluntary, the agency ultimately agreed upon would lack the necessary power base to effectively implement a regional solid waste program. Dissatisfied members could withdraw at any time, leaving the agency without jurisdiction over that area.

e. Expansion of the present ABAG arrangement to include responsibility for managing the Demonstration project.

Utilizing the existing ABAG structure to manage the project would minimize the time, expense and effort otherwise involved in organizing a new governmental structure. This arrangement could spread the cost of the project over a wide area, as ABAG membership represents the nine-county Bay region. ABAG would lend the project its strength and stature as an already-established on-going entity.

But ABAG is itself a joint exercise of powers agency, and therefore has all of the structural drawbacks noted in the previous section. Some people feel the authority of a joint powers agency is too limited, and if the existing ABAG agreement were used, there would be complications including San Joaquin and Sacramento counties which are also affected by the Demonstration. Also, ABAG's traditional role is one of planning. To actually manage the Demonstration, the ABAG General Assembly would have to agree to this expanded role.

f. A nonprofit corporation.

This arrangement, with a board of directors perhaps made up of ABAG's Executive Committee, could raise its capital from private sources and could give private interests like the scavenger companies a vote in its management, which could not be done under a joint exercise of powers agreement. But such a structure may not be feasible for managing a Demonstration which will operate only two years and has an uncertain future beyond that.

3. The Joint Powers Agreement

After reviewing these governmental structures, the subcommittee made no specific choices. Some members expressed a desire to consider the alternative structures as exhaustively as possible in order to choose an organization, refine it, decide how to implement it, and have a foundation on which to build funding plans. Others felt it would be proceeding too quickly to do this. They felt that the costs of the Demonstration and the direct participants should be known before the form of the organization could be chosen. Several members of the subcommittee repeatedly expressed very strong opposition to proposing any sort of structure that might be considered to be beyond the scope of the project, and they wanted to be sure that whatever intergovernmental arrangement was proposed, it not be confused with regional government.

As progress towards selecting an intergovernmental structure was proceeding slowly, ABAG's legal counsel was directed to research what arrangements would be necessary between Action Committee members to serve as a starting point for applications to fund the Demonstration. Legal counsel's resulting suggestion was that the Action Committee reconstitute itself by executing a joint powers agreement, rather than proceed as an "ad hoc" committee.

A point of disagreement developed concerning the purpose of the proposed joint exercise of powers arrangement. Some committee members felt that a joint powers agency was needed that could not only seek funding but manage the Demonstration as well. From this standpoint it seemed logical that the membership should consist of the Bay Area counties, the largest, most powerful local jurisdictions with adequate taxing capabilities. Supporters of the more limited joint powers agreement felt that it would be politically impossible to get the counties into a joint powers agreement at that time.

The latter opinion prevailed and the subcommittee finally recommended that the members of the Action Committee should reconstitute themselves under a joint powers agreement. The Action Committee approved this recommendation, with the understanding that this first joint powers agreement would be simply to help the present members of the Action Committee seek funding for the Demonstration and that a separate intergovernmental institution would eventually be required to actually manage the Demonstration.

A Joint Powers Agreement was subsequently prepared and by November was signed by a sufficient number of the Action Committee members to make it a legal document. The text of the joint powers agreement is contained in the Appendix.

4. Approach to the Future

The deliberations of the Action Committee occurred over many months, and by the end of the EPA grant period, no clear agreement emerged as to the kind of intergovernmental organization to be formed for the Demonstration and beyond. The spectrum of opinion ranged from those who saw regional government as a serious threat and wanted only a voluntary arrangement between agreeing local jurisdictions to those clearly in favor of an immediate multi-purpose, limited function, regional structure that would include the management of solid waste as one of its responsibilities.

It might therefore be useful to review some of the concepts of the SPUR report concerning regional management of solid wastes.

1. A regional waste management plan should be carried out in accordance with the following principles:
    a. A new governmental entity is needed to carry out a region-wide wastes management program for the Bay Area.
    b. To the greatest extent feasible, private enterprise should be encouraged to undertake all aspects of solid wastes management--collection, resource recovery and disposal.
    c. Inventive proposals to carry out aspects of the regional plan should be encouraged, and should be evaluated on the basis of their conformity to the regional plan.

2. An intergovernmental entity is needed for regional management of solid wastes for the following reasons:

    a. to manage demonstration projects that would have region-wide application;

    b. to solicit and accept funding from state, federal and other sources;

    c. to allocate costs fairly among local jurisdictions;

    d. to plan comprehensively, including transportation and land use as well as waste processing and disposal;

    e. to facilitate inter-county transfers of waste materials;

    f. to make a systems approach to resource recovery more feasible;

    g. and finally, to eliminate the need for direct federal and state controls.

3. An ultimate regional solid wastes management entity, regardless of its form, should have the following powers and duties:

    a. to arrange for the processing of the region's solid wastes;

    b. to arrange for the building or leasing of a system of regional processing/transfer stations and transport systems;

    c. to set fees sufficient to be self-supporting (which would include the costs of processing and conversion of solid wastes, less income from sales of reclaimed material);

    d. to regulate the selling of all separated materials on the basis of long-term, competitive bids (recognizing that in some cases private processers will pay for wastes to be recycled, and in other cases the public agency may have to pay them to take the wastes);

e. to regulate the processing of all toxic and special wastes so as to recover as much reusable material as possible and also to minimize the toxicity of the residues, and then to dispose of such residues in specially approved sites under rigidly enforced conditions to protect public health;

f. to require that all independent management of wastes (i.e., all wastes not entering the regional management system) meet standards established to protect public health and the environment;

g. to set standards for the manner in which waste materials are to be delivered to the processing/transfer stations after collection from homes, businesses and factories;

h. to encourage and support research and demonstration programs designed to process and recover resources from waste materials in the most efficient manner and at the lowest cost consistent with standards of environmental protection and resource conservation.

For the purposes of the Demonstration project, only a few of the functions of a regional solid waste management entity need be served by the selected intergovernmental structure. These include:

a. the ability to manage the Demonstration project;

b. the ability to solicit and accept funding from state, federal and other sources;

c. the ability to fairly allocate the regional share of costs over local jurisdictions.

From these considerations, four possible intergovernmental structures emerge as the most practical forms to manage the Bay Delta Resource Recovery Demonstration Project. The first involves the establishment of a Joint Exercise of Powers Agency consisting of the eleven counties of the Bay Delta region. The directors of the Agency could be elected officials of the constituent units, or they could be persons chosen by these units of government, either laymen or local officials such as public works directors. The second possibility is that ABAG expand its traditional role of advisory planning to assume stewardship of the Demonstration project. The third possibility is that an eleven-county Joint Exercise of Powers Agency be formed which would contract with ABAG for administrative services. And the last alternative is for ABAG and the San Joaquin and Sacramento Councils of Government to enter into a memorandum of understanding to undertake the Demonstration.

Each of these alternatives would satisfy the requirements of the Demonstration and is suitable for transformation into the solid waste management arm of a possible future regional organization.

III. THE BAY DELTA RESOURCE RECOVERY DEMONSTRATION PROJECT

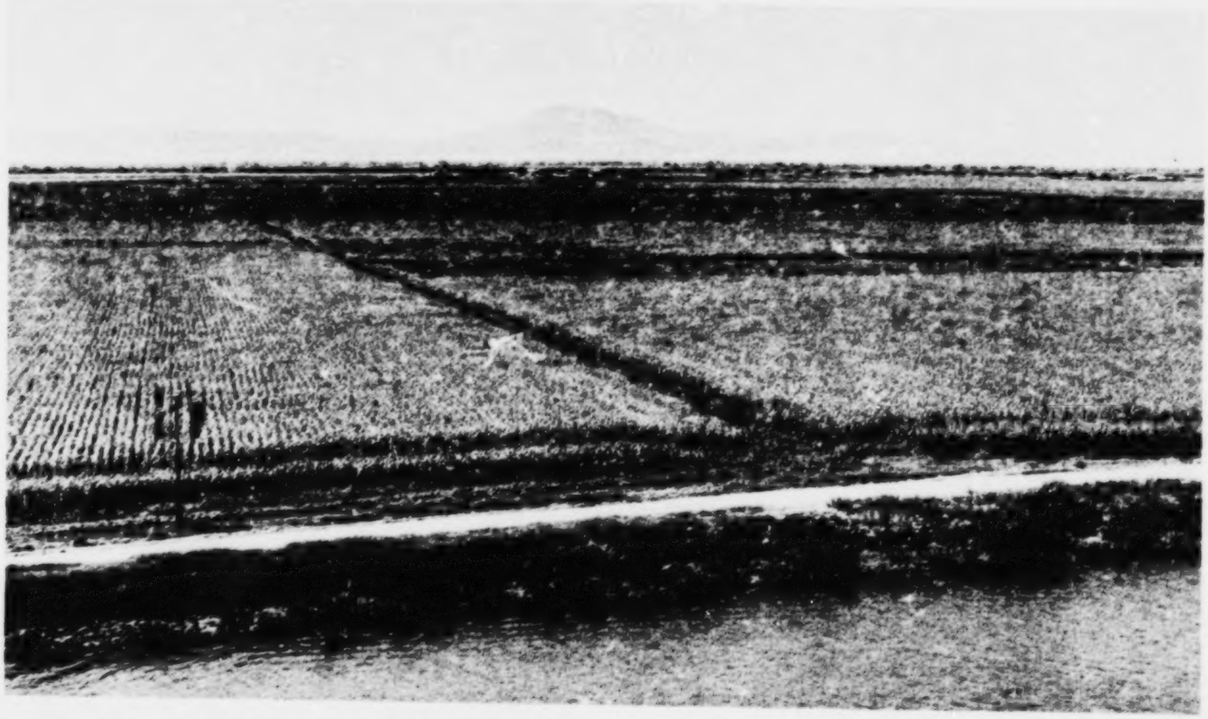
A. SELECTION OF PARTICIPANTS

Due to the high degree of interest in the Demonstration, an equal opportunity to participate was offered to all potentially interested parties through an invitation letter mailed out by the Action Committee in March 1973. This letter described the Demonstration project and listed the criteria that would be used in selecting the final candidates. All cities, counties and sanitary districts of the Bay-Delta Area were invited to make known their interest in furnishing raw materials, or supplying the site for the processing operations. Expressions of interest for transportation systems and Delta land sites were requested from transportation companies and Delta land owners. Invitations were sent to over 300 parties. Those parties that responded with interest were then contacted to determine how they might fit into the Demonstration plan.

The islands that were considered for the project were Mandeville Island, Lower Jones Tract (the portion owned by Allied Properties), Rindge Tract, Bradford Island, Orwood Tract, Woodward Island and Jersey Island. These islands were evaluated on the basis of the following criteria:

- owner interest in land reclamation and levee reinforcement using compost
- how typical the soil and levee conditions were of the Delta
- accessibility by barge, rail or truck
- willingness to participate--no public objections.

On the basis of these criteria, Mandeville Island was ultimately selected by the Action Committee as the site for the Demonstration project.



General views of Mandeville Island.

The island is under single ownership, which simplifies the problem of objections from neighboring land owners. The levee conditions of the island were felt to be serious, yet not so severe as to cause the Demonstration unwarranted risks. The island is conveniently reached by barge. And Al Zuckermann, the owner, has a high interest in experimenting with levee reinforcement using compost refuse.

In selecting source material for the Demonstration, the principle was observed that refuse disposal is primarily a public responsibility, even if disposal operations were contracted to private enterprise. Therefore, offers for source material were solicited from governmental units rather than private disposal operators, although the two often work closely together. The waste source candidates that were evaluated included San Francisco, Berkeley, Oakland, Palo Alto, San Leandro, San Joaquin County, and a joint proposal from Antioch, Pittsburg and Brentwood.

The criteria used to evaluate the source candidates were:

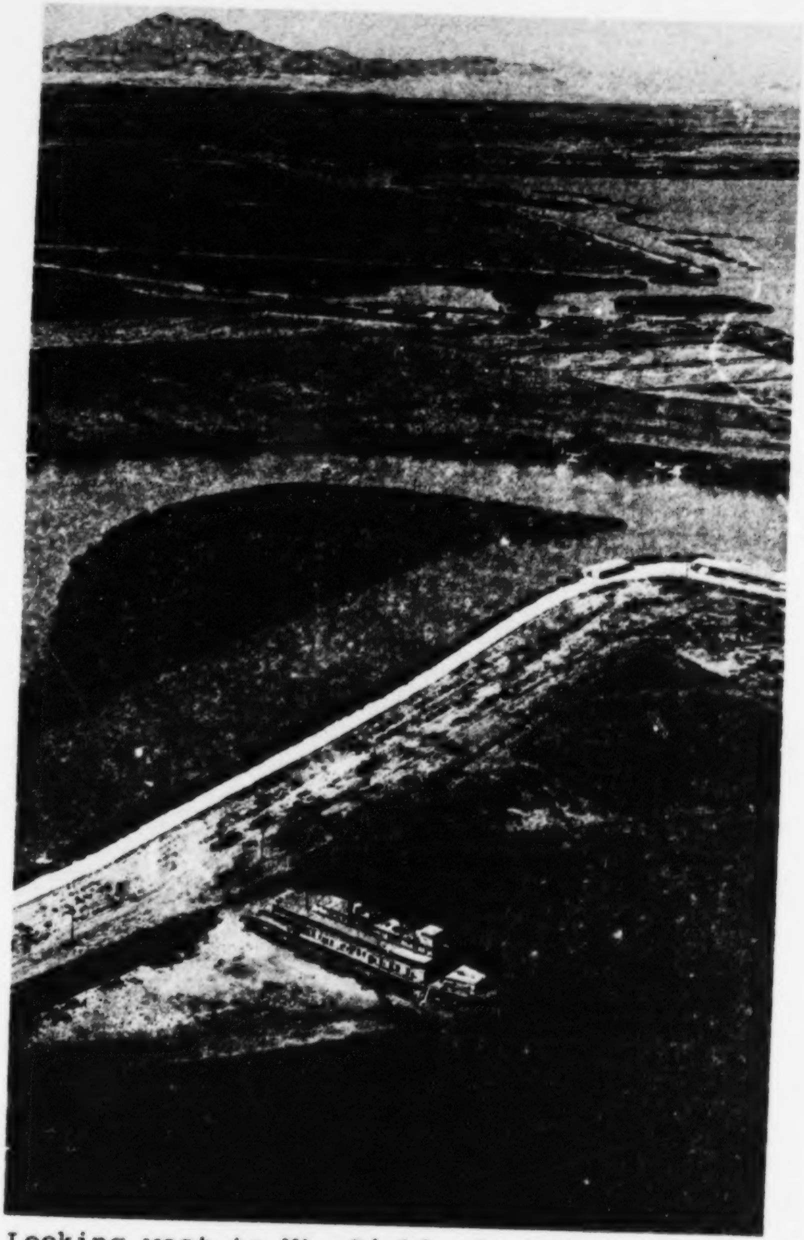
- availability of sufficient refuse and sewage sludge
- availability of a composting site
- readiness to deliver material to the Demonstration
- dependability of supply
- prototype value of the processing operation
- political and geographic regionality
- expandability of supply
- permanence after the Demonstration
- operating coordination of the independent parties
- benefit to the city in keeping its disposal options open
- degree of community interest in the Demonstration
- net cost to the Demonstration.

The process of evaluating the candidates was slow, with a wide range of technical and political factors to be considered. Many communities had joined the Action Committee in hopes of being the selected site. After months of intense competition the candidates narrowed down to three--Berkeley, San Francisco and San Joaquin County. The San Joaquin proposal came from the Countywide Solid Waste Management Committee, but did not have the official endorsement of any city governments in the county or the County Board of Supervisors.

Inner slope of levee at test site on Mandeville Island.

Levee road at test site on Mandeville Island.

Portion of Middle River adjacent to test site on Mandeville Island.



Looking west to Mt. Diablo from Mandeville Island. Paddlewheel boat plugged levee break in the 1930's.

The San Francisco Proposal offered the best materials processing, but at the last minute the intended land for a composting site became unavailable. The City of Berkeley appeared to have assembled the best package proposal, offering a sufficient quantity of refuse and sludge, a transfer station to house processing equipment and, most importantly, a site for composting within its own jurisdiction. Thus, in September 1973, Berkeley was selected as the site for the Demonstration.

However, San Francisco remained keenly interested in participating in the Demonstration and returned to the Action Committee with a proposal that included land for the composting at Sierra Point in South San Francisco. The merits of a two-city demonstration, combining a small urban city with municipal refuse collection and a large metropolitan city with franchised refuse operations, were weighed by the Action Committee and felt to be a more truly regional approach. Finally, in October the decision was reached to conduct the processing and composting operations from both Berkeley and San Francisco. The proposals of each city are contained in the Appendix.

B. PRELIMINARY SYSTEM DESIGN

1. Processing and Resource Recovery

In Berkeley all municipal refuse collected by route trucks would be delivered to a transfer station for processing. This would total about 150 tons per day (46 truckloads, five days per week). An arrangement has been made with the Oakland Scavenger Company to deliver an additional 50 tons per day should it be necessary for the Demonstration.[1] The final design and layout of the transfer station will be developed as part of the Demonstration, but the following preliminary design offers a concept of the operation.

The transfer station should have sufficient floor space for storing one day's refuse and room for the maneuvering of a front loader to begin breaking up material for loading into a primary feed conveyor. The material would feed into a shredding mill to reduce particle size to between two and six inches. The output of the mill is fed into an air classifier to separate the light material from the heavy fraction. The light material, estimated to be 85% of the total, would consist mostly of paper and other organics and a small percentage of light plastics, such as polyethylene film. The light fraction would be conveyed into self-unloading transfer trucks for delivery to the composting site at the Berkeley landfill. The heavy fraction, consisting of metals, glass, rubber, leather and heavy plastics, would pass through a two-stage suspended-type magnetic separator to remove ferrous metals such as tin cans. About 5% of the input refuse is expected to be ferrous metal, which can be sold for remelt to the steel industry. About 15 tons per day of the heavy fraction would remain, and it is unlikely that the small volume of metals and glass could economically be recovered. The heavy fraction that is not recovered for recycling would be disposed of at the Berkeley landfill.

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[1] Newspaper recycling in Berkeley is accomplished by an ongoing program of householder separation and monthly collection and is not considered as part of the Demonstration project.

In San Francisco 150 tons per day of shredded, air-classified organics would be obtained from the existing transfer station, owned and operated by the Sanitary Fill Company.[1] This station currently receives 2,000 tons per day of municipal refuse, about half of which is from residential collection. The residential refuse is delivered to one side of the building and passed through a hammer mill for rough shredding, followed by magnetic separation of ferrous metals. The mill breaks open plastic bags and exposes ferrous material to a three-stage magnetic separator which recovers the metal for sale to the copper industry. An economic feasibility study on further resource recovery is currently being conducted by the San Francisco Scavengers under an EPA grant. If the study proves positive, the operators would install their own equipment for further shredding, air classification and recovery of aluminum and other non-ferrous metals and possibly glass. One hundred and fifty (150) tons per day of the light organic fraction from the air classifier would then be diverted for use in the Demonstration. If the study indicates the economic infeasibility of installing this resource recovery equipment, the Demonstration would require the addition of a small shredding and air classification operation to the existing transfer station to produce the 150 tons per day of shredded organics. In either event, the material would be loaded into self-unloading vehicles for transport to a composting site at Sierra Point, about two miles away.

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[1] As in Berkeley, newspapers are collected separately for recycling in San Francisco, and this operation is not included as part of the Demonstration project.

2. Composting

Composting is the high-speed decomposition of organic wastes to render a stable, dark-brown humus product. This is accomplished by mechanical processing to maintain proper environmental factors of moisture, aeration, temperature, pH level and carbon:nitrogen ratio. It is the control of these variables that distinguishes composting from the natural decomposition that occurs in an open dump, a sanitary landfill or a manure heap.

At both the Berkeley and Sierra Point sites, up to 50 tons per day of partially de-watered sewage sludge (20% solids) would be mixed with the organic refuse during the composting process. In Berkeley, sludge would be delivered from the East Bay Municipal Utility District's secondary treatment plant in Oakland. At Sierra Point, sludge would be delivered from San Francisco's southeast sewage treatment plant, a primary treatment facility.

Many different types of composting systems have been developed in the United States and Europe to achieve stabilization of organic wastes. The system chosen for the Demonstration is aerobic windrow composting. Aerobic composting is characterized by high temperatures (140°F to 170°F), absence of foul odors and prompt decomposition (a matter of days or weeks depending on the mechanical assist and the maintenance of proper environmental factors).

The size and method of operation of a windrow composting facility depend on the type of equipment used for turning the windrows. The two predominant pieces of equipment on the market are the General Motors Terex-Cobey and the Aerobie marketed by AENCO of Wilmington, Delaware. The Terex-Cobey is a rugged machine of proven capability. However, preliminary estimates indicate that its operation requires about twice the land area of the Aerobie because it cannot completely turn a pile in a single pass as can the Aerobie. As land requirement may become a limiting factor in composting all of the Bay Area's wastes, the Aerobie is referred to in the following discussion. This description is set forth only as a concept and, as such, may be altered when contracts are let for final design and engineering of the facility. This discussion applies to both San Francisco and Berkeley operations.

Compost Yard

The composting operation would occur in a paved and enclosed composting yard. A 250-foot by 500-foot area is probably sufficient. Asphalt paving would provide a smooth surface to allow for a clean operation. A 1% grade would provide for proper drainage of rain water and leachate into holding tanks so that no wastewater discharge from the operation would result. The yard should be enclosed to catch any blowing shreds of paper. This can be accomplished with a cable-supported wire mesh structure. There should probably be solid walls for the first 12 feet of sidewall and then screening, including a roof, above that. Experience may show that such an enclosure is unnecessary, but it is included as a precaution against possible nuisance.

Refuse-Sludge Mixing

Shredded refuse and dried sludge would be trucked to the composting yard and mixed together in the form of a rough windrow. This would be consolidated by a skip loader feeding the Aerobie, which would give the waste its first churning, add moisture and form the windrows.

Windrow Turning

The windrows should be turned every few days for a period of about three weeks. This is accomplished by the Aerobie composter, which drives down the windrow, straddling it and passing material by a cylindrical drum with teeth that shreds the refuse and forms a vertical-walled windrow, 9 feet wide by 9 feet high, behind it. The Aerobie turns the complete windrow each time it advances through it. The machine has a hose and reel system rigged to it for squirting water into the refuse as it is being turned. This is important because the initial refuse-sludge mixture has about 25% moisture, and about 50% is recommended for efficient composting. During the rainy winter months, runoff water captured in the leachate ponds can be recycled back into the windrows; in dry periods fresh water can be used.

Degree of Stabilization

Temperature is probably the best single indicator of the degree of stabilization during the composting process. As soon as the refuse and sludge are mixed into the windrow, bacterial activity proceeds at an accelerated pace. In composting studies conducted at the University of California in 1953,[1] the temperature generally rose from ambient to 60°C or 70°C within four days. These high temperatures, which are characteristic of good aerobic composting, result from excess energy released by the bacteria as they consume the organic matter. When the "food supply" is consumed, bacterial activity declines and the temperature drops accordingly. The resulting compost is dark brown in color and has an earthy odor like rich soil. The exact frequency of turning and length of detention to achieve this state are determined by the skill and experience of the operator, coupled with laboratory tests. The compost plant is like a sewage treatment plant or perhaps more poetically, like a winery. Proper control of the biologic regime depends on skilled management supplemented by scientific testing.

Screening

When the compost is sufficiently stabilized, it should be screened to remove sheet plastic and oversize particles before being loaded on the barge. This is done by loading the compost into a large shaker screen that vibrates the smaller material through it and removes larger particles. The screened compost is then loaded into a barge. The residuals would require disposal. In Berkeley this would entail hauling to the disposal area of the landfill; in San Francisco it would involve backhauling to the transfer station by the trucks delivering the shredded refuse. Approximately 100 tons of screened compost per day would be produced at each site.

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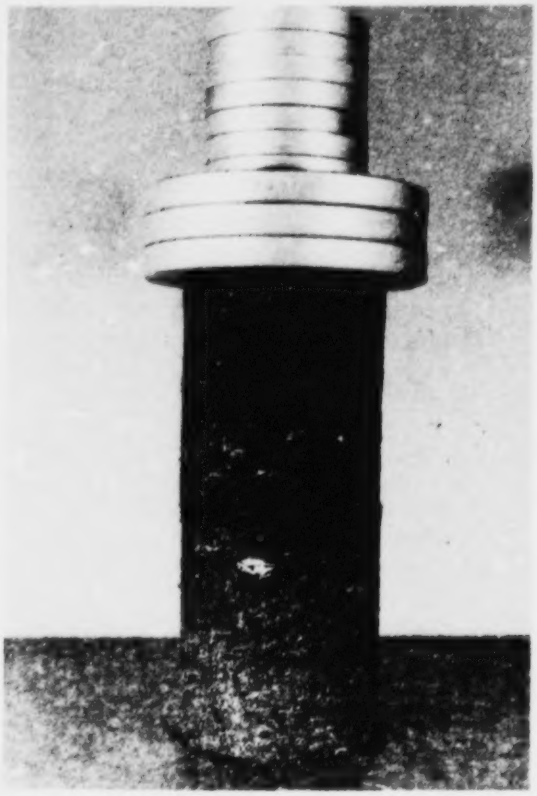
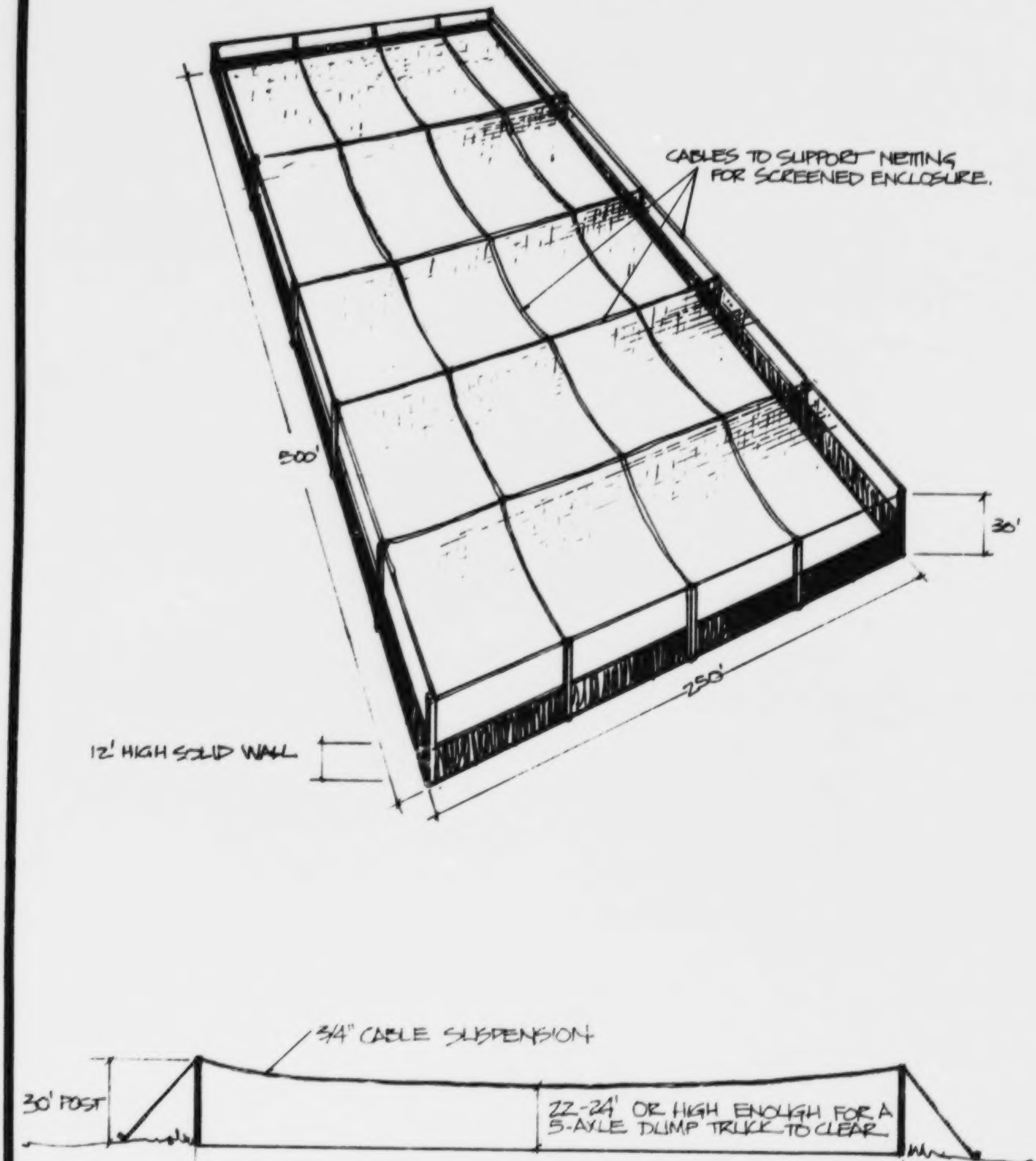
[1] P. H. McGauhey and C. G. Golueke. Reclamation of Municipal Refuse by Composting, Technical Bulletin No. 9, SERL, UC Berkeley, 1953.

Compost, compressed to simulate field conditions, shown under a 9.5 kilogram load.



Sample of compost produced from shredded, air-classified refuse and sewage sludge.


CABLES TO SUPPORT NETTING FOR SCREENED ENCLOSURE.
500'
30'
250'
12' HIGH SOLID WALL
3/4" CABLE SUSPENSION
30' POST
22-24' OR HIGH ENOUGH FOR A 5-AXLE DUMP TRUCK TO CLEAR
250'

Composting Yard **Figure 6**

Bay Delta Resource Recovery Demonstration Project

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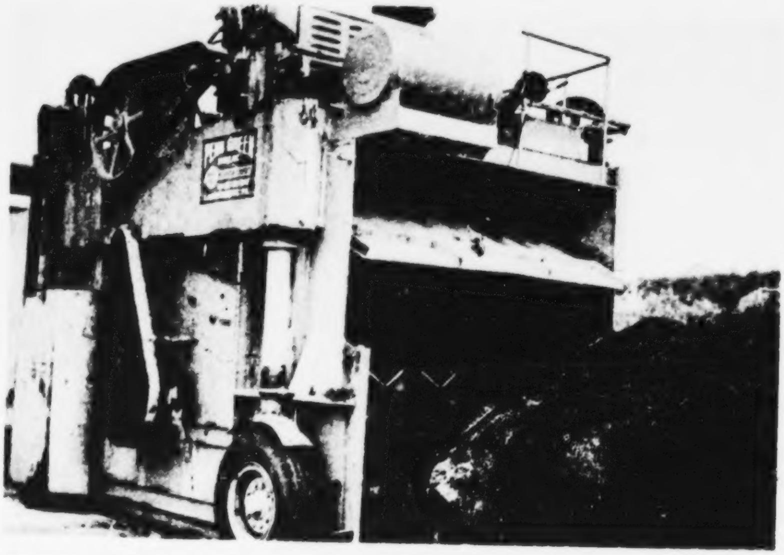


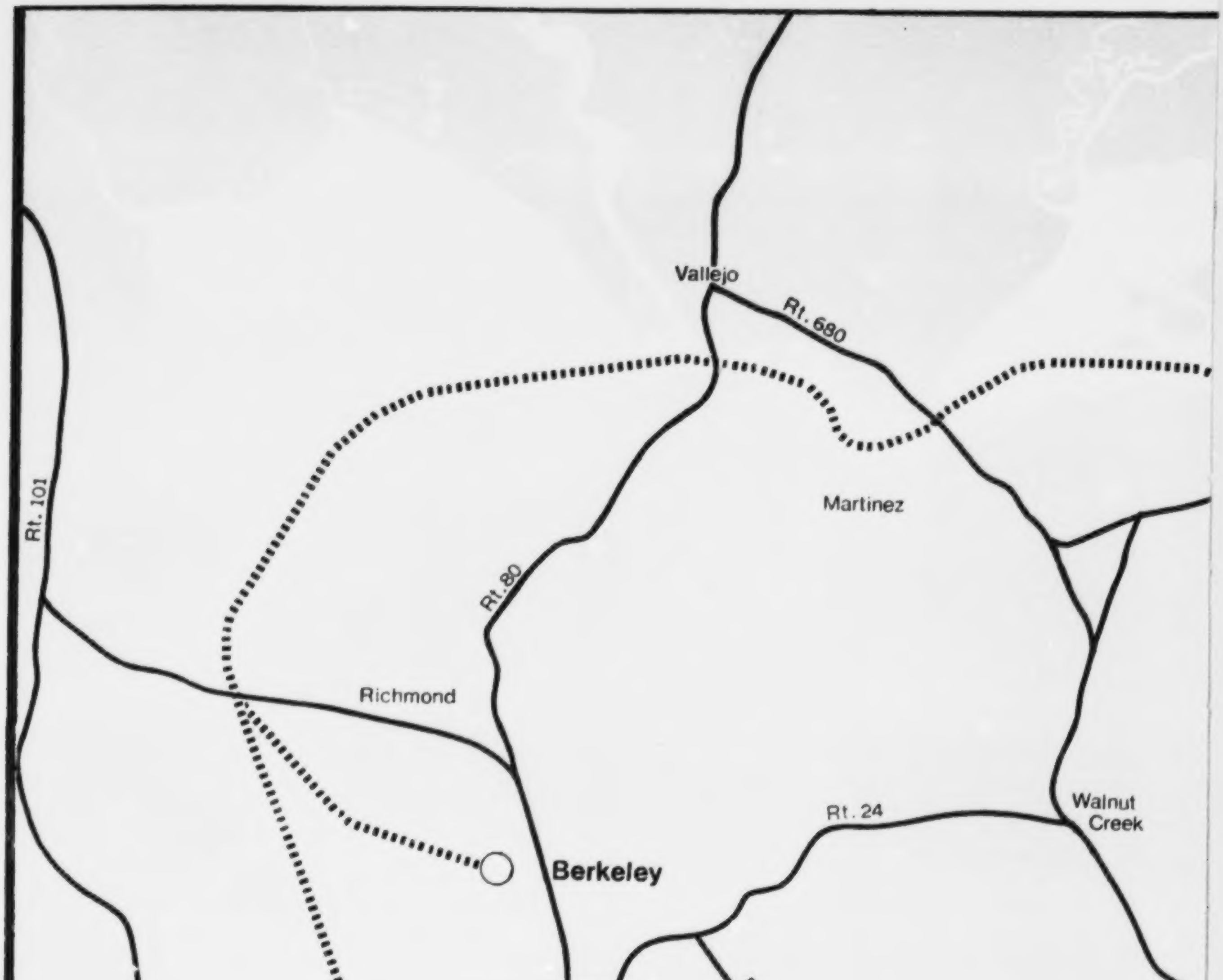
Composting Vehicle Operating on a Windrow.

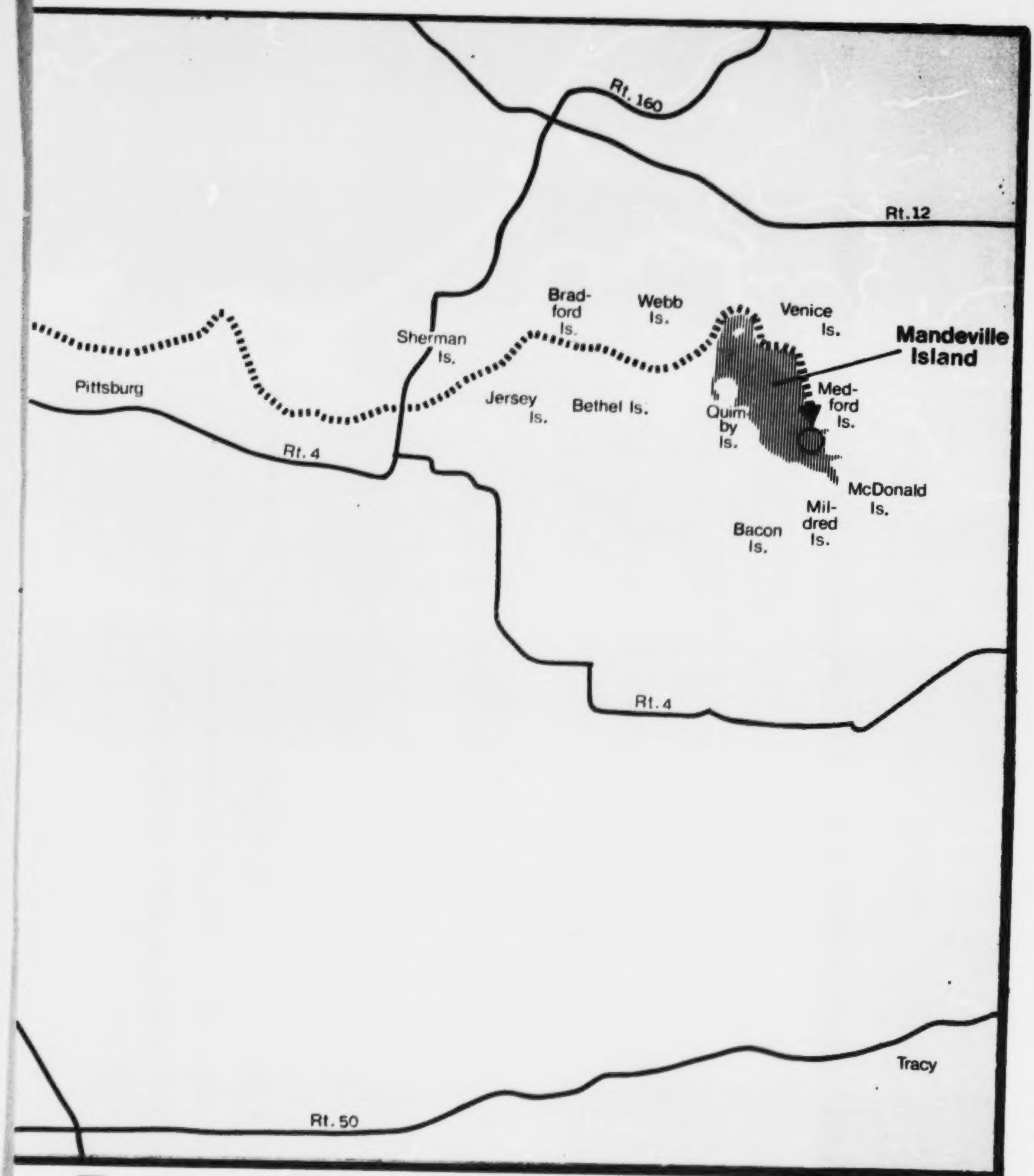
3. Transport to Delta

Compost from each site would be loaded into a 600-ton barge docked in the adjacent waterway and shipped once a week to Mandeville Island. This transportation method is cheaper, more reliable during winter operations and is less energy-consuming than truck haul. The following discussion is presented as a concept of how the barging operation could be performed and, as with composting, may be altered in the final design.

The compost will be hauled from the composting area to the barge by dump truck. The sides of the truck can be extended so that it will have a capacity of 37 cubic yards; this would hold 12 1/2 tons of compost. As these trucks will not be subject to any overhead limitations, it is suggested that the sides be extended an additional two feet to prevent loss of material. The truck is loaded by the composting crew, then backs up a ramp and dumps its load into the barge. Waterfront men will move the barge to obtain an even distribution. The compost should be damp when loaded to prevent loss. A shroud over the ramp and canvas chute hanging down into the barge would help prevent loss during the tow. Dolphins, a small wharf, a truck ramp, a double drum winch and miscellaneous tools and rigging will be needed at the waterfront. One truck driver and two waterfront men should be sufficient labor for the pilot operation. A breakwater at the Berkeley site may be required to protect the loading facility. Two barges will be needed for each site, one being loaded at the composting site while the other is at Mandeville Island being unloaded. One tug will be needed to make one tow per week from each site. It is assumed that dry-docking and repairs can be made on weekends.

Compost would be unloaded at Mandeville Island by a 35-ton truck crane mounted on a wharf. Compost would be removed by clamshell bucket and loaded into a dump truck. The truck would drive onto a trestle extending into the island and would dump the compost onto the island surface. A concrete crossing may be needed on the levee to support the constant truck traffic and to support one end of the long steel girders from the wharf and trestle.


Vallejo
Rt. 680
Martinez
Rt. 101
Rt. 80
Richmond
Walnut Creek
Rt. 24
Berkeley
Rt. 13
Rt. 580
Oakland
San Francisco
Rt. 17
Rt. 280
Rt. 101
Sierra Point


Rt. 160
Rt. 12
Brad-ford Is.
Webb Is.
Venice Is.
Mandeville Island
Sherman Is.
Pittsburg
Jersey Is.
Bethel Is.
Quim-by Is.
Med-ford Is.
Rt. 4
McDonald Is.
Mil-dred Is.
Bacon Is.
Rt. 4
Tracy
Rt. 50

Transport Barge Route **Figure 8**

Bay Delta Resource Recovery Demonstration Project

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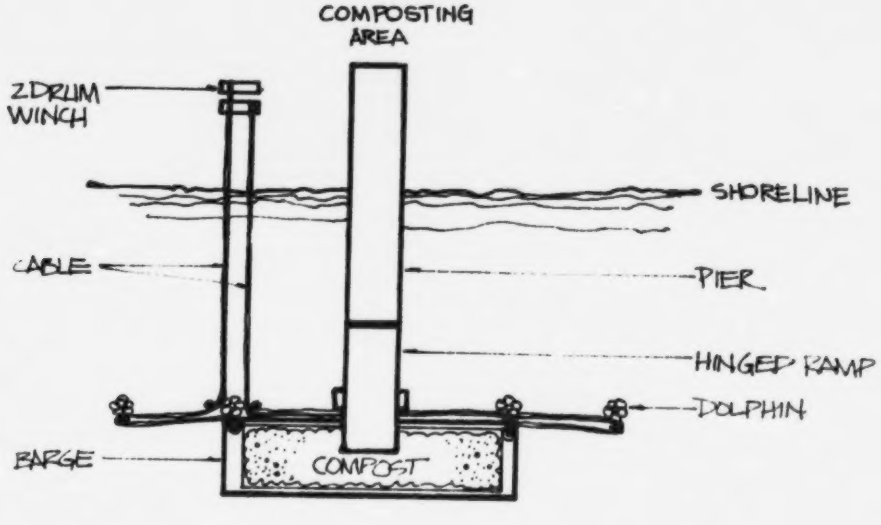
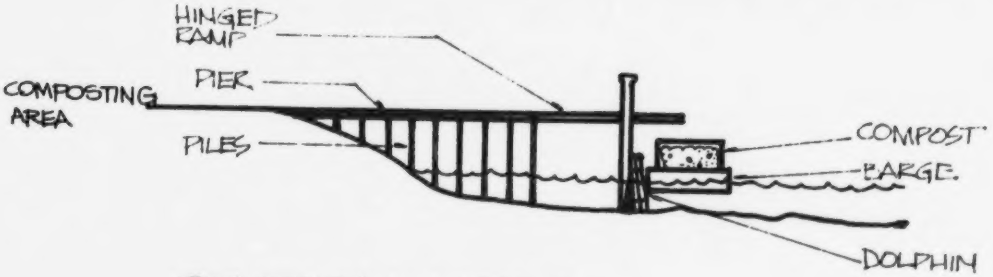
34-B


COMPOSTING AREA
2DRUM WINCH
SHORELINE
CABLE
PIER
HINGED RAMP
DOLPHIN
BARGE
COMPOST

PLAN VIEW

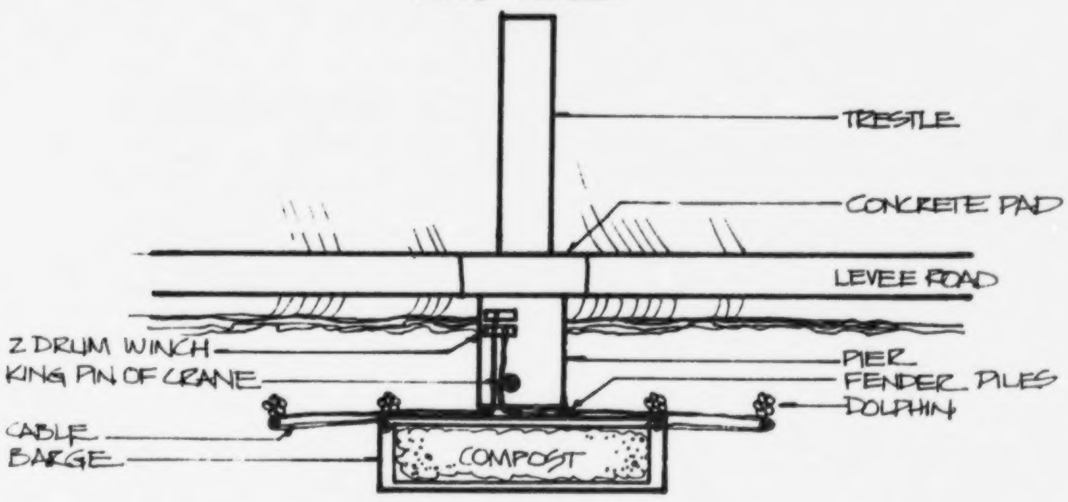

HINGED RAMP
PIER
COMPOSTING AREA
PILES
COMPOST
BARGE
DOLPHIN

SECTION VIEW

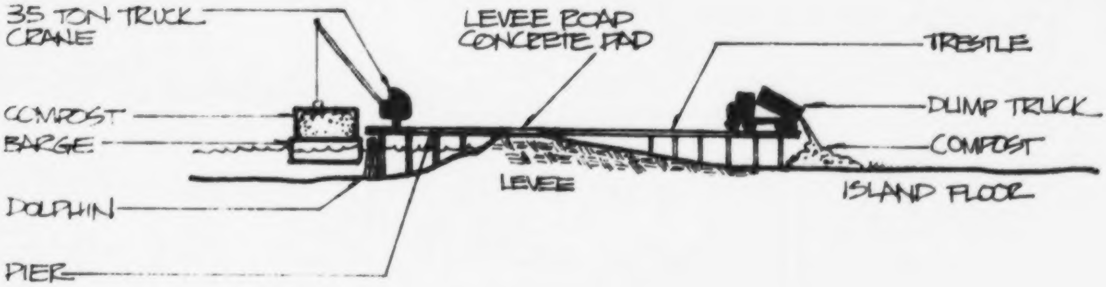
Barge Loading Concept **Figure 7**

Bay Delta Resource Recovery Demonstration Project

elp/ABAG


ISLAND FLOOR
TRESTLE
CONCRETE PAD
LEVEE ROAD
2 DRUM WINCH
KING PIN OF CRANE
PIER
FENDER PILES
DOLPHIN
CABLE
BARGE
COMPOST

PLAN VIEW


35 TON TRUCK CRANE
LEVEE ROAD CONCRETE PAD
TRESTLE
COMPOST
BARGE
DUMP TRUCK
COMPOST
LEVEE
ISLAND FLOOR
DOLPHIN
PIER

SECTION VIEW

Unloading Barge Concept **Figure 9**

Bay Delta Resource Recovery Demonstration Project

elp/ABAG

4. Berm Construction

Compost delivered to Mandeville Island would be used to construct a berm behind a test section of levee. The purpose of the berm is to strengthen the levee against failure from high water pressures in the outside water channel and to serve as a new agricultural soil.

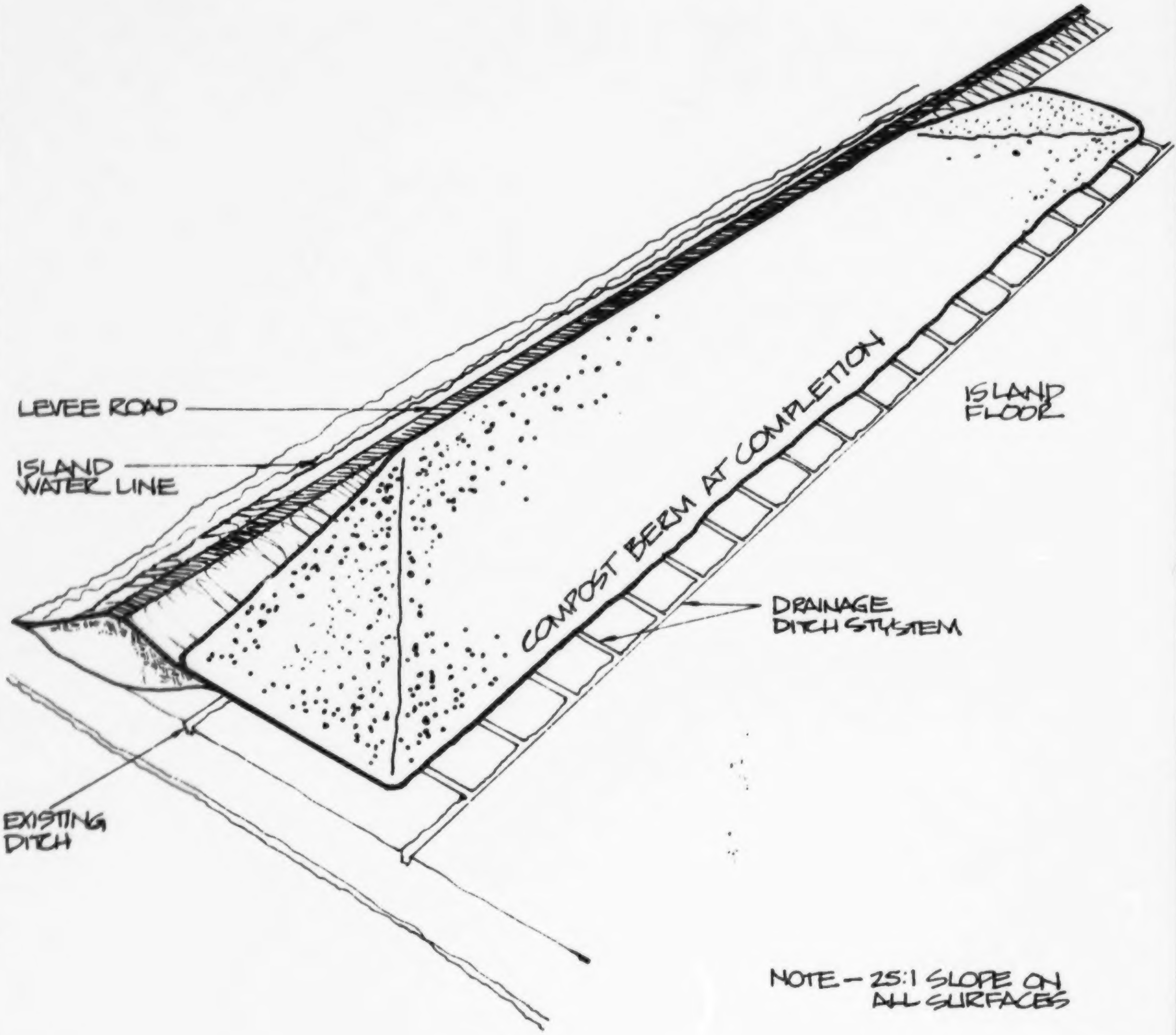
The berm would be built with a uniform slope of 25 horizontal to 1 vertical from the crest of the levee to the island floor. As the levee is approximately 20 feet high, the berm would extend 500 feet inland from the levee crest. Compost would be moved from the base of the trestle to the placement area by a scraper vehicle and applied in wide broad layers approximately one foot thick. A crawler tractor would compact the compost to the required density. Before the compost is applied, a drainage system should be constructed to prevent water pressures from building up beneath the berm where seepage may emerge from the levee and the adjacent ground.

Nonuniform settlement due to compression of the underlying peat would probably cause cracking of the levee and repair of these cracks would be a necessary part of the construction operations. To prevent failures of the peat under the weight of the compost fill, the berm would have to be constructed slowly. All slopes, whether permanent or temporary, would have to be gradual. If the berm is built to the levee crest, approximately 1,800 feet of levee could be reinforced over a two-year period.

An office trailer and graveled pad for vehicle parking would also be constructed at the site.

5. Monitoring

Monitoring of air quality, water quality, soil stability and biotic impacts would be conducted to determine the environmental and engineering effects of the compost berm. Knowledge would also be gained about the extent of composting required, materials handling techniques and levee reinforcement procedures that could be applied to a full-scale operation. After emplacement, as the surface of the compost decomposes and weathers into a soil-like mantle, the agricultural productivity of the material would also be monitored to determine the agricultural worth of compost as a parent material base for the development of new agricultural soil.


LEVEE ROAD
ISLAND WATER LINE
COMPOST BERM AT COMPLETION
ISLAND FLOOR
DRAINAGE DITCH STYSTEM
EXISTING DITCH
NOTE – 25:1 SLOPE ON ALL SURFACES

Compost Berm Concept **Figure 11**

Bay Delta Resource Recovery Demonstration Project

etp/ABAG

a. Water Quality

The purpose of the water quality studies is to determine the water pollution potential of the compost berm--its variation with compost age, degree of compaction, fluctuation of the ground water level and the rate of downward percolation of surface water.

The following assumptions underlie the design of the proposed water quality studies:

- The compost as it arrives at the island is sufficiently stable to produce no new liquid leachate although it still contains leachate in its absorbed water.
- Above the zone of saturation in the water profile of the berm, the compost will remain aerobic in upper layers and aerobic or anaerobic in the lower layers; in the zone of saturation it may become anaerobic.
- Once the surface of the berm is planted with crops, agricultural chemicals will be applied as needed to promote crop growth.
- All application of water to the berm for irrigation or salt leaching will be overhead or to the surface.

Water quality monitoring would involve three types of tests. First, tests would be conducted on the composting process itself. This would include sampling of both the solid material and leachates. Second, lysimeter tests would be conducted to determine the water pollution potential of the compost berm behind the levee. A lysimeter tank would be filled with compost to simulate the berm and would operate with either downward percolation of applied water or with complete saturation of the bottom layers. Third, full-scale site tests would be conducted prior to and during compost placement. A network of sampling points would be established to permit the sampling of applied water, drainage water and ground water around the test levee site. These tests will furnish information on current water pollution levels which can be used to compare the net increment imposed by the compost berm. Laboratory measurements of water quality would be grouped as follows:

- toxicants (heavy metals, phenols, phthalates),
- pesticides (chlorinated hydrocarbons, polychlorinated biphenyls),

- biostimulants (nitrogen, phosphorous),
- oxygen-consuming potential (TOC),
- pathogens (coliform),
- mineral solids (electrical conductivity).

b. Air Quality

The purpose of air quality monitoring during the Demonstration is to investigate what effect the use of compost will have on the air quality of Mandeville Island and the Delta, both during the unloading and placement procedure and subsequently after the fill is in place and begins to weather into soil.

Monitoring by visual observation is the most realistic procedure for evaluating air quality during compost unloading, placement and compaction. Observations should be made under both mild to moderate winds (generally under 10 to 15 MPH when there is little or no wind erosion taking place from bare peat soils) and under strong winds (generally over 15 MPH when dust is likely to erode from dry bare peat soils).

The degree of dust pollution can be evaluated by the subjective judgment of changes in color, visibility (through the air mass) and reflection characteristics. Attention should also be directed toward the wind erodibility of small bits of thin plastic film.

After the reinforcement of a section of the levee is completed and the final surface attained, the surface is expected to slowly weather into a soil-like mantle. The wind erodibility of this developing surface can be compared with that of nearby peat soils by the use of simple impinger samplers placed at ground level, with procedures similar to those used by A. B. Carlton of the University of California during his study of peat dust in the late 1950s.

c. Soil Stability

A number of field studies should be undertaken during the course of the Demonstration to monitor the effects of the berm:

- Settlements, horizontal movements and spreading of the levee crest should be monitored carefully during the entire project. Construction should be halted if the settlements exceed those predicted or if the lateral movement of the water side of the levee crest exceeds five feet. Construction should only be resumed if a careful study indicates that failure of the levee is not impending.

- A thorough program of crack surveillance and repair should be conducted continually during construction and after construction. The best method for detecting and repairing cracks will require further study before and during construction, but it is clear that extensive cracking could weaken the levees considerably, and this matter will require very careful attention.
- Piezometric levels in the drains and in the peat beneath the berm should be observed to insure that the water pressures are in fact maintained at low, safe levels by the drainage system.
- Densities and water contents of the compost should be measured on a regular basis, and supervision should be provided to insure that the densities measured are representative of the entire fill.
- In-situ permeability tests should be performed in the peat, the compost and the drain materials using the falling head permeability procedure with standpipe piezometers.
- The settlements at the toe of the levee should be monitored to check the accuracy of settlement predictions.

d. Agricultural Productivity

Agricultural productivity experiments would be conducted in the lysimeters used for measuring the quality of compost leachate. The purpose of these experiments is to obtain preliminary information on how compost would behave as an agricultural soil. In the first year barley may be the only feasible crop, and its yield will be depressed due to the high organic content of this new soil. Particular attention should be paid to plant toxicity due to possible uptake of heavy metals from the compost. Leaf analysis should also be conducted for possible concentrations of elements toxic to animals but not to plants (e.g., molybdenum, arsenic and selenium). The need for mixing Delta peat, dredged sand or fertilizer with the compost material and irrigation requirements would be investigated to obtain preliminary information for later field research.

Once a section of test berm has been built behind the levee, experiments would be initiated to determine crop response under field conditions and to determine proper agricultural practices on an elevated section of Delta land. Normal crops of the area should be grown (asparagus, corn, milo, tomatoes, oats and barley). Crop and soil responses would be monitored to determine farming modifications that may be necessary.

e. Biotic Effects

A comprehensive monitoring program would be conducted to provide data on the transportation of PCBs, phthalate acid esters, heavy metals and organochlorine residues from the compost material into the surrounding Delta environment. The monitoring must be initiated prior to any deposition of compost material, and be conducted for a time period adequate to compensate for the time-lag involved in the leaching processes. The program should be structured as follows:

- The establishment of a number of monitoring stations in the vicinity of the test site to monitor pollutant levels of soil and sediment samples. Samples taken prior to the project will indicate the undisturbed background levels, and it is recommended that these samples be taken along a transect at varying distances from the test site and at a frequency adequate to permit reliable statistical evaluation of the data. Emphasis must be given to soil and sediments rather than water, as the latter is known to be unreliable for the investigation of pollutant contamination levels in wildlife.
- Determine pre- and post-study pollutant concentrations in a carefully selected animal "indicator" species. Samples of a single or several indicator species must be taken from downstream and upstream of the study site at frequent intervals to provide reliable data on the trends and the distribution of pollutants. The indicator species selected should be a resident (and not a mobile animal), one that can be easily collected (i.e., abundant) and preferably a filter feeder. Potential candidates include a mollusk, the Asiatic clam (Corbicula fluminea), the crayfish (Pacifastacus leniusculus), the mysid shrimp (Neomysis awatschensis) or the amphipod

(*Corophium*).[1] The mysid shrimp is probably the ideal species since it is a major food item of striped bass, American shad, green sturgeon, channel catfish, black crappie and warmouth.[2] Analyses based on highly mobile or predatory fish are not reliable as it is impossible to isolate the source of contamination. It is imperative that the sampling be statistically defensible and provide information on the ecological impact of any contaminants introduced by the compost.

- By sampling, determine the daily input of pollutants contained in the sewage sludge and dry solid wastes to provide essential background data.

C. ECONOMIC ANALYSIS AND PROPOSED FUNDING

1. Estimating Approach

The cost of conducting the pilot-scale Demonstration has been estimated in terms of the funds that need to be raised. Contributions in cash, facilities, manpower and services provided by donor cities and scavengers have not been included in this estimate.

The costs of the system are broken down into capital expenses, annual operating costs and credits to the system. Operating costs are calculated for a two-year period from the time facility construction and equipment check-out are completed. As the Demonstration would occur over a relatively short period of time, it is assumed that equipment would be rented or contracted rather than purchased whenever possible.

Credits to the system have been computed for sale of ferrous material reclaimed by Demonstration-funded equipment. It is also assumed that capital equipment would have a salvage value at the end of the Demonstration, either from dismantling and sale of equipment or from payment by another agency that would take over the operation of the system. Credits have not been assigned for savings in disposal costs, environmental enhancement or other factors which would not affect the funding needed to be raised for the Demonstration. All costs are expressed in terms of 1973 dollars.

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[1] California Department of Fish and Game, *Ecological Studies* of the Sacramento-San Joaquin Estuary, *op. cit*.

[2] *Ibid*.

2. Summary of Estimated Cost

The total cost of the Demonstration is estimated to be $6.9 million as shown in the following table.

	(A) Capital Costs	(B) Annual Operating Costs	(C)=(A)+2(B) Total Cost
Processing/transfer station	253,000	162,000	577,000
Composting	2,250,000	692,000	3,634,000
Barge transport	500,000	545,000	1,590,000
Compost placement	110,000	200,000	510,000
Monitoring	54,000	170,000	394,000
Project supervision	---	50,000	100,000
Other	25,000	25,000	75,000
Project Total ($)	3,192,000	1,844,000	6,880,000

3. Cost Analysis

The cost estimate is presented according to the principal functions of the Demonstration: (a) refuse processing, (b) composting, (c) barge transport, (d) compost placement on the island, (e) monitoring, (f) project supervision and (g) other expenses. The estimate is based on the following assumptions for Berkeley and San Francisco:

Berkeley

- Berkeley provides at its own expense land and a building for a processing/transfer station located in its industrial area and land for a composting facility at its landfill.
- The Demonstration pays for the cost of equipment in the transfer station, operation of the transfer station, transportation of shredded material to

the composting facility and operation of the composting facility.
- Refuse is fine-shredded in the transfer station and ferrous materials are removed magnetically for sale to the steel industry.
- Sludge is delivered to the composting facility by the East Bay Municipal Utilities District at the District's own expense.
- Barging from the landfill is the mode of transportation.

San Francisco

- A mill and air classifier will be installed at the transfer station as a result of the material recovery study being conducted by the San Francisco refuse firms.[1]
- Shredded refuse and sludge are delivered to the composting site at no cost to the Demonstration.
- Land at Sierra Point is available for lease at $1 per year.
- Compost is barged from Sierra Point to Mandeville Island.

a. Processing/Transfer Station

This will apply to Berkeley only since San Francisco already has an operational transfer station.

Capital Costs

Scale	$ 15,000
Feed conveyor 360 feet^2 @ $117/feet^2	42,000
Mill (25 tons/hour)	70,000
Output conveyor 80 feet^2 @ $117/feet^2	9,000
Two-stage magnetic separators	20,000
Electrical controls	15,000
Office and service equipment	10,000
One front loader	60,000
Contingency @ 10%	24,000
Engineering and startup @ 20%	48,000
Total	$313,000
Less salvage value after two years:	
transfer station equipment - $241,000 @ 25%	-60,000
Total Capital Costs	$253,000

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[1] A small shredding facility must be added to the existing transfer station if the refuse firms do not add their own resource recovery system. Estimated cost is $150,000.

Annual Operating Costs

Labor - 3 men @ $20,000	$ 60,000
Maintenance and operation mill @ 50¢/ton	20,000
Other maintenance @ 10% of equipment cost ($171,000)	17,000
Power - 11 kwh/ton x 39,000 tons @ 25¢/kwh	11,000
Transport to compost area - truck and driver @ $25/hour x 10 hours/ day x 260 days	63,000
Contingency @ 20%	34,000
Total	$205,000
Less sale of ferrous material: 150 tons/day x 5% ferrous x $20/ton net price x 260 days	-43,000
Total Annual Operating Cost	$162,000

b. Composting

Capital Costs - Berkeley

Yard	
paving, screened enclosure, leachate tanks 125,000 feet^2 @ $3/feet^2	$ 375,000
sludge mixing facility	50,000
maintenance facility	25,000
Equipment	
3 composting machines @ $80,000/each	240,000
2 front loaders @ $80,000/each	160,000
pumps and piping	20,000
portable screen and conveyors	50,000
pickup truck and automobile	6,000
Contingency @ 10%	93,000
Engineering and startup @ 20%	186,000
Total Capital Costs (Berkeley)	$1,205,000
Less salvage value after two years: composting equipment - $476,000 @ 25%	-119,000
	$1,086,000

Capital Costs - San Francisco

Yard	
paving, screened enclosure, leachate tanks 125,000 feet^2 @ $3/$\text{feet}^2$	$ 375,000
sludge mixing facility	50,000
maintenance facility	25,000
Equipment	
3 composting machines @ $80,000/each	240,000
2 front loaders @ $80,000/each	160,000
pumps and piping	20,000
portable screen and conveyors	50,000
pickup and automobile	6,000
Utility hookup - water and electricity	60,000
Contingency @ 10%	99,000
Engineering and startup @ 20%	198,000
Total Capital Costs (San Francisco)	$1,283,000
Less salvage value after two years:	
composting equipment - $476,000 @ 25%	-119,000
	$2,250,000

Operating Cost - Berkeley

12 men @ $20,000/year	$ 240,000
Maintenance and operation @ 10% of equipment cost ($476,000)	48,000
Contingency @ 20%	58,000
	$ 346,000

Operating Cost - San Francisco

Same as Berkeley	$ 346,000
Total Operating Cost	$ 692,000

c. Barge Transport

Capital Costs

Berkeley loading facility - wharf, dolphins, winch, etc.	$150,000
San Francisco loading facility - wharf, dolphins, winch, etc.	150,000
Island unloading facility - wharf, dolphins, trestle	200,000
Total Capital Cost	$500,000

Operating Cost - Berkeley

Move compost to barge: truck and driver @ $25/hour x 8 hours/day x 260 days	$ 52,000
Barge loading: 2 men @ $25,000/year	50,000
Tug towing: 20 hours @ $80/hour x 52 weeks	83,000
Two 600-ton barges @ $1,500/month x 12 months	36,000
Total Operating Cost (Berkeley)	$221,000

Operating Cost - San Francisco

Move compost to barge: truck and driver @ $25/hour x 8 hours/day x 260 days	$ 52,000
Barge loading: 2 men @ $25,000/year	50,000
Tug towing: 22 hours @ $80/hour x 52 weeks	92,000
Two 600-ton barges @ $1,500/month x 12 months	36,000
Total Operating Cost (San Francisco)	$230,000
Island Unloading: truck crane and dump-truck @ $9,800/week x 52 weeks	$ 94,000
Total Annual Operating Cost	$545,000

d. Compost Placement

Capital Costs - drainage system under berm - 10,000 feet @ $11/foot	$110,000
Operating Costs - scraper, grader and water wagon @ $3,850/week x 52 weeks	$200,000

e. Monitoring

Capital Costs

Project office and parking area	$ 15,000
Furniture and supplies	9,000
Test equipment	30,000
Total Capital Costs	$ 54,000

Operating Costs

Water quality	$ 35,000
Air quality	15,000
Agricultural worth	20,000
Soils monitoring	50,000
Biotic monitoring	50,000
Total Operating Costs	$170,000

f. Project Supervision

Annual Operating Cost	$ 50,000

g. Other Costs

Capital Costs

Other expenses such as management costs for program implementation	$ 25,000

Annual Operating Costs

Island land leasing: 20 acres @ $50/acre	$ 1,000
Island road maintenance: 2 miles @ $1,000/mile	2,000
Miscellaneous (insurance, fees, etc.)	22,000
Total Annual Operating Cost	$ 25,000

4. Cost Allocation

The Demonstration has two broad objectives: to open up a new method of disposing of organic solid waste by conversion to a usable material; and to show that there is a permanent and unlimited "market" for this material in the preserving, replacement and upgrading of soil mantle.

The first objective serves primarily the communities that produce solid wastes; the second objective serves the broader interest in land productivity.

The two objectives taken together clearly involve local, state and federal interests, and the costs of the Demonstration should therefore be allocated equitably among these three levels.

Because the federal government is the owner of such a large portion of this nation's land, because it is so deeply involved in agricultural production and because of its interest in the loss of soil from strip mining operations, it is eminently clear that the federal government should bear at least 50% of the cost of the Demonstration.

The state government also has an unusually high stake in this Demonstration. In recent legislation it has called for a new approach to solid waste management which will give major emphasis to resource conservation. The unique level of state interest in this Demonstration, however, concerns the Delta. The Delta is a vital link in the state's fisheries, its food production, its recreation, its industry and its transportation, and it is the very heart of the state's total water resources.

For these reasons, the state's and region's 50% of the Demonstration cost should be divided, not 25% and 25% as previous precedent might suggest, but on the far more logical and equitable basis of 40% and 10%, respectively.

Regional costs should be distributed over the area that stands to benefit from a successful Demonstration. This includes the entire Bay-Delta region, involving the nine Bay Area counties and the two Delta counties of San Joaquin and Sacramento.

In view of the state's legislated policy of regional solid waste management cooperation through county units established by Senate Bill 5, it is recommended that the regional share of the Demonstration cost be allocated on a county-by-county basis.

The estimated $6.9 million for the Demonstration would need to be allocated over a period of three fiscal years--one year for construction and startup operations and two years for operation of the Demonstration. The yearly project cost would then be:

	% of Total	Cost Per Year	3-Year Total
Federal	50%	$1,147,000	$3,440,000
State	40%	$ 917,000	$2,752,000
Regional	10%	$ 229,000	$ 688,000
Totals		$2,293,000	$6,880,000

5. Equitable Regional Cost Sharing

It is proposed that the regional share of the Demonstration cost be allocated among counties on a population basis. Solid waste generation quantities were also investigated as a basis for determining cost shares, but available statistics from the State Department of Health were considered to be too unreliable on which to base cash outlays.

A precedent for basing cost sharing on population was set in the Netherlands recently, where a regional incineration plan was funded by 23 municipalities on a pro rata basis according to population.[1] Furthermore, population figures are fairly closely correlated with municipal refuse generation quantities and each county stands to benefit from the Demonstration by the amount of its solid waste disposal load.

Population figures by county are shown in the following table. The percent of the regional total is also shown along with the estimated cost per county per year, assuming 10% regional financing.

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[1] Solid Wastes Management, Rotterdam Burns 700,000 Tons of Refuse Yearly, September 1973, p. 68.

Regional Share of Demonstration Cost

County	Population[1]	% of Regional Total	Cost Per Year
Alameda	1,120,800	19.4	$ 44,426
Contra Costa	587,100	10.2	23,358
Marin	206,758	3.6	8,244
Napa	79,140	1.4	3,206
Sacramento	668,100	11.6	26,564
San Francisco	715,674	12.4	28,396
San Joaquin	290,208	5.0	11,450
San Mateo	556,729	9.6	21,984
Santa Clara	1,144,000	19.8	45,342
Solano	181,900	3.1	7,099
Sonoma	222,600	3.9	8,931
Total	5,773,009	100.0	$229,000

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[1] State Department of Finance, November 1972.

IV. CONCEPT OF A FULL-SCALE SYSTEM

A. PROCESSING STATIONS AND RESOURCE RECOVERY

As public sentiment for resource recovery continues to mount, and as close-in landfill sites around the perimeter of San Francisco Bay become unavailable for further dumping operations, more and more communities will need to develop transfer stations regardless of the ultimate disposition of the waste. The San Francisco transfer station is a prototype of this operation.

Once the need for a transfer station is established, it is increasingly apparent that the recovery of resources from solid wastes is technically feasible, environmentally beneficial and probably economically viable, given a sufficient quantity of refuse. The recycling of solid wastes conserves natural resources and has been shown to conserve energy and to reduce by a factor of 10 to 100 the amount of wastes produced in obtaining raw materials for manufacturing.

A comprehensive system for utilizing municipal solid wastes in the Bay Area would include the recycling of large quantities of newsprint by householder separation and the recovery of metals and glass by mechanical separation in processing stations. The SPUR report projected a need for 16 such transfer stations although the exact number and location of these stations will depend upon many factors.

A typical processing station would service an area up to 25 or 30 miles distant and would process in excess of 2,000 tons per day. This system might include two or three intermediate transfer facilities to achieve higher efficiency in transporting refuse to the processing station.

A multitude of resource recovery systems adapted from mining and lumbering industries are currently under development or installation across the United States. Most of these systems are based on the principal of particle size reduction followed by ballistic separation of the light organic fraction of solid wastes from the heavy, largely inert fraction.

In order to obtain preliminary information on the possible economics of recovering materials from refuse, a marketing study was performed for newspapers, ferrous metal, aluminum, other metals and glass, with the following conclusions:

Ferrous Metals

Ferrous metal is removed from the waste stream, after shredding or crushing, by natural or electromagnets. If coarsely shredded, it has a current market value of $15.00 a ton for use in copper processing. A new market is developing for steel cans in the scrap steel industry. If finely shredded to a density of 60 pounds per cubic foot, steel cans may sell for $24.00 to $40.00 per ton in the near future.

Aluminum

Aluminum can be recovered, after shredding and air classification, by one of two processes--a heavy media separation system which "floats" shredded aluminum out of suspension or by a newly developed system that can remove nonmagnetic conductive materials based upon eddy-current phenomena. The latter is still in the developmental stage. Current market value for clean, shredded aluminum is $280.00 per ton.

Other Metals

Metals that remain after ferrous and aluminum separation include copper, zinc, brass and lead. These metals can also be removed by heavy media or eddy-current separation systems. These metals have a potential market value of $400.00 per ton with foreign buyers.

Newspaper

There is no effective means for directly recycling newspaper from municipal wastes, unless it is separated by the householder. Newspapers can be collected in racks under trucks during normal route collection or by a monthly separate collection. The market value of newspaper has fluctuated dramatically over the last several years. Due to recent high demand by foreign buyers, the current market price is $25.00 to $40.00 per ton.

Glass, Ceramics and Sand

These materials are removed by vibrating screens and can be used as aggregate or fill material at a market value of $3.00 to $5.00 per ton. If color separation can be achieved, glass can be sold for remelting into new glass containers.

The following table indicates the possible income from the sale of recovered materials. Assuming recovery of newspaper, all metals and glass, a value of $6.58 per ton of refuse can be realized. However, this does not take into consideration the high cost of recovering the material or storage and transportation to the purchase point. The economics of resource recovery will vary according to the market area, whether a transfer station is already available and other factors, all of which must be evaluated for each specific facility being considered.

POSSIBLE INCOME FROM RECOVERY OF MATERIAL FROM RESIDENTIAL REFUSE

	% Recoverable from Refuse	Market Value/Ton	Value per Ton of Refuse
Newspaper[1]	10	$ 25.00	$ 2.50
Ferrous metal	5	15.00	0.75
Aluminum cans	.4	280.00	1.12
Glass and sand	7	3.00	0.21
Other metals	.5	400.00	2.00
			$ 6.58

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[1] Newspaper is estimated to be 20% of the residential wastestream. 50% separation is assumed.

A rough estimate of the cost of operating a processing station can be determined from several facilities now in operation. Based on experience in Madison, Wisconsin, an 800 ton per day shredding facility is projected to cost $2.30 per ton, including haul to a disposal site a half a mile away.[1] Operation of the 2,000 ton per day San Francisco transfer station, excluding shredding and ferrous metal recovery, costs $2.75 per ton. This does not include the cost of transportation to the Mountain View landfill. The ferrous recovery system currently in operation is presumably at least a break-even operation. Additional shredding and resource recovery systems for metals and glass are being studied by the San Francisco refuse firms and preliminary results indicate the system could break even or require a small subsidy. Based on these indications, it is estimated that the cost of operating a large-scale processing station, after the net revenue from resource recovery is obtained, should be on the order of $3.00 per ton.

B. COMPOSTING

Composting technology has been extensively developed in both Europe and the United States. The various systems can be categorized as either enclosed or open. Enclosed systems involve containment of organic wastes in a digester for a few days, during which considerable stabilization can be achieved by mechanical control of environmental factors such as moisture, aeration and carbon:nitrogen ratio. The Fairfield-Hardy digester proposed for the Delaware Reclamation project is an example of this type of system.[2] These systems require less land and achieve faster stabilization than open systems, although a maturation process of several months is often required, the capital investment is high, and the largest unit systems which have been designed only have a capacity of 200-300 tons per day. Enclosed systems may be impractical when considering the composting of the 5-10,000 tons per day of organic wastes produced by the whole Bay Area.

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[1] Final Report on a Milling Project at Madison, Wisconsin, Volume 1, March 1973, p. 97.

[2] Pasquale Canzano, Project Engineer, Delaware Reclamation Project. Personal Communication, October 1973.

Open systems involve the piling of organic wastes into windrows, which are turned and moistened every few days for a period of several weeks. Windrow composting requires a lower capital investment, and the only limit to its capacity is the availability of land on which to pile the windrows. This land requirement is the chief disadvantage of windrow composting in large quantities. If one acre of land is required for every 30 tons per day of organic refuse processed, a total of perhaps 300 acres of land would be needed for the entire Bay Area. This raises the question of where large-scale windrow composting could be performed.

If sufficient land were available, composting could be performed directly adjacent to the processing stations. Alternatively, one or several regional composting operations could be established to receive organic wastes shipped from the various processing stations.

The concept in the SPUR report was to do the composting right on the Delta island where the compost was to be placed. Experience gained during the Demonstration may indicate this is feasible; but problems of leachate containment, disposal of screened material and other factors make such an operation appear inadvisable on the basis of current information.

The cost of composting as reported in the literature varies considerably, some estimates ranging from $2.90/per ton of incoming refuse to $13.00 per ton as shown in the following table.

SYSTEM	CAPACITY (tons per day)	COST/TON
John Snell process	400	$ 2.90[1]
Fairfield-Hardy	100	13.00[1]
Fairfield-Hardy	400	8.50[1]
Beltsville, Md. (sludge only)	600	3.50[2]

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[1] Recovery and Utilization of Municipal Solid Waste.

[2] Conservation News, Volume 38, No. 28, Sewage Sludge - Back to the Farm, October 15, 1973.

Based on this data, and considering that preprocessing would be accomplished at transfer stations, it is projected that large scale composting could cost on the order of $5.00 per ton. If regional composting sites are used, requiring long transportation distances from processing stations, a maximum of $3.00 per ton for transportation might have to be added to the cost. Another $1.00 per ton of incoming refuse should be allowed for disposal of residuals.

C. TRANSPORT TO DELTA AND COMPOST PLACEMENT

Transport of compost to the Delta in a full-scale operation can be accomplished much more efficiently than in the Demonstration due to economies of scale. If composting is performed adjacent to a barge loading operation, the material can be loaded into barges by conveyor. One thousand or two thousand ton capacity self-unloading barges could be designed with sloping sides, a screw conveyor and an elevator. At the island the barges could feed a high belt conveyor which would cross the levee and dump compost onto the island floor. The unloading operation could occur at a single point on the island, or conceivably, the barge could unload at various points around the island as sections of the levee berm were completed.

Scraper vehicles could be used to move compost to the placement location if unloading occurs at a single point on the island. Once placed on an island, compost would need to be compacted by a tracked bulldozer.

Rail haul of compost to the Delta is also a possibility, but would depend on locating the composting site near a rail line. Also rail haul would only be an option in the Southern Delta where the Santa Fe rail line crosses Orwood Tract, Woodward Island and Lower Jones Tract.

The cost to transport and place 1,000 tons of compost per day from a mid-bay location such as Berkeley or San Francisco over a 20-year period is estimated in the following table.

COST OF TRANSPORT AND PLACEMENT ON DELTA ISLAND OF 1,000 TONS PER DAY OF COMPOST FROM BAY AREA

Item	Cost Per Ton of Compost[1]
Load barges	$ 1.00
Tow barges to Delta (25-hour round trip)	2.70
Unload barges	.50
Place and compact compost	3.00
Total	$ 7.20

D. IMPACT ON SOLID WASTE DISPOSAL

It is important to consider what percentage of the Bay Area's solid waste disposal load the Bay Delta plan could recover by recycling and land reclamation. Based on figures developed by the Sanitary Engineering Research Laboratory of the University of California,[2] it is estimated that quantities of solid wastes disposed of in the Bay Area can be classified according to the following categories:

	Tons Per Year Disposed[3]	Percentage of Total
Residential	1,500,000	35.7
Commercial and Public (including sewage sludge)	1,800,000	42.9
Construction and Demolition	600,000	14.3
Industrial	300,000	7.1
Total	4,200,000	100.0%

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[1] Includes capital costs amortized over 20 years.

[2] Comprehensive Studies of Solid Waste Management, SERL.

[3] These figures are based on 1966 statistics. Current disposal quantities are greater, although the percentage composition has presumably not changed significantly.

Of this total it is assumed that only the residential and commercial fraction is suitable for processing. If half of all newspapers could be sorted for recycling and if other residential and commercial wastes were to be processed for recovery of metals and glass and composting of the organic remainder, the final disposition of all wastes is estimated as follows:

	% of Total Wastes
Compost (35% moisture)	40
Recovered metals, glass, paper	10
Carbon dioxide and water lost to atmosphere	20
Residual for disposal	30
Total	100%

The quantity remaining for disposal may increase if restrictions are placed on the extent of municipal wastes suitable for composting, or could decrease if some of the residuals, including plastics, rubber, solvents, etc., could be utilized as fuel to partially offset the energy requirements of a recycling system. The heavy demolition debris might also prove to be of beneficial use when the handling of it is coordinated at a regional level.

E. IMPACT ON LEVEE STABILIZATION

According to the most recent figures from the State Department of Health, 5.7 million tons of solid waste are disposed of in the Bay Area annually.

If 40% of this can be converted to compost, 2.25 million tons of compost could be produced per year. This quantity is sufficient to treat 5.5 miles of levee per year assuming:

- the berm requires 3,000 cubic feet of fill per foot of levee
- compost is 65% solids
- compost solids compact to 33 pounds/cubic foot

This quantity of compost could increase, however, since annual solid waste generation is likely to keep growing and since agricultural wastes, which would roughly double the available supply of organic materials for composting may require disposal in the future.

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APPENDIX A

OFFICE OF THE MAYOR
CITY OF BERKELEY
CALIFORNIA

WARREN WIDENER
Mayor

September 18, 1973

Members of the Action Committee
Bay Delta Resource Recovery Demonstration Project
c/o Association of Bay Area Governments
Hotel Claremont
Berkeley, CA 94705

Ladies and Gentlemen:

On behalf of the Berkeley City Council, I am pleased to submit our revised Participant Community Proposal as authorized at our regular Council meeting on September 18.

Since your action of September 5, tentatively electing Berkeley as a Demonstration Community, a number of steps toward answering your concerns have been taken, including:

A. On September 11, the City Council authorized me to appoint a special committee of Council members to meet in conjunction with City staff and representatives of the Solid Waste Commission, and with representatives of the Demonstration Project on details of the City's proposal. The appointed Committee members are Councilwoman Hancock, Councilman Kallgren, Councilwoman Hone and myself.

B. Further discussions, including on-site visits, have been held between the Project Consultants and City representatives on the matter of alternative sites.

C. On September 18, the City Council approved the attached amended proposal and authorized me to transmit the document to the Action Committee. The major change in the proposal as approved was the inclusion of a clarifying statement that a three-acre site for composting on city-owned waterfront land was determined to be appropriate.

I trust that the above actions sufficiently resolve all reservations held by the Action Committee, and that the City of Berkeley will receive final approval as the host community for the Project.

Sincerely,

Warren Widener

Warren Widener
Mayor

cc: Berkeley City Council
City Manager
Solid Waste Commission Members

BAY DELTA RESOURCE RECOVERY DEMONSTRATION PROJECT

SUMMARY OF

PARTICIPANT COMMUNITY PROPOSAL

CITY OF BERKELEY

Planning Department
August 31, 1973
Revised September 18, 1973

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PROPOSAL SUMMARY
CITY OF BERKELEY

BAY DELTA DEMONSTRATION PROJECT

On July 24, 1973 the Berkeley City Council authorized submission of a proposal to the ABAG/Bay Delta Resource Recovery Demonstration Project in support of the City's desire to be selected as a participant community. That action was communicated to the Project consultants by letter from the Berkeley City Manager. Subsequently, the City has been able to further refine some elements of its proposal. This summary proposal, therefore, represents a current description of the City's proposal to the Project as of August 31, 1973.

Material

The entire amount of daily garbage collected by the City of Berkeley (140-160 tons/day) will be furnished to the Project. This material will be supplemented with additional tonnage by Oakland Scavenger from collections in Albany and Emeryville to achieve a grand total of approximately 200 tons/day. Although no official commitments have been made, it is expected that sewerage sludge in an appropriate amount can be obtained from the East Bay Municipal Utilities District.

Facilities

A site of approximately three acres for composting functions will be furnished by the City. The City will assume responsibility for the establishment of a building on a site of about one acre adjacent to the composting site for receiving/processing functions.

While no specific site other than the present sanitary landfill* is presently available under City control or management, approximately four sites have been identified as potentially suitable for purposes of the demonstration. (See attached site map.)

Apart from the Demonstration Project, the City has interests in and will pursue steps to acquire land for a solid waste management facility and other municipal uses to replace current sanitary land fill operations on the Berkeley waterfront. Final decisions of site selection cannot be made prior to selection of the participant community by September, 1973. However, a specific determination on site selection and necessary land acquisition will be made during fiscal year 1973-1974. It is fully expected that a site will be determined and steps initiated toward acquisition, if required, well before implementation of the Demonstration Project.

The Berkeley City Council has determined to offer land and buildings necessary for the Demonstration Project cognizant of a potential cost responsibility to the City of over $900,000. This determination was made in recognition of the need to acquire a site for solid waste management operations in the immediate future, irrespective of whether the City is selected as a participant community. In concluding its 1973-1974 budget deliberation on August 28, the City Council took actions to make available approximately $300,000 for Solid Waste Management projects, including site acquisition expenses.

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*A site on the northeast portion of the current landfill [illegible] as appropriate for a composting [illegible] tion Project. (Action by Berkeley City Council, [illegible]

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Processing

The City of Berkeley offers to provide a site of one acre and a building to house receiving and initial processing operations. The City proposes that equipping such a building be a financial responsibility of the Project. Operational responsibility for processing functions could be by the City of Berkeley, by another party under contract to the City, or by the Project. The City proposes that these matters be defined by mutual agreement subsequent to participant community selection.

Composting

The City proposes that facilities (other than land) and financial responsibility for composting functions rest with the Project. The City is willing to consider entering into a contract with the Project to provide operational responsibility for composting functions if compensated for all attendant costs. The City is agreeable to other parties performing composting functions as desired by the Project, subject only to the specification of appropriate limitations on the City's scope of responsibility where functions interface.

Transportation to Delta

It is proposed that transportation of composted material to the disposition site be a Project responsibility. The City is willing to consider assuming that responsibility under contract if all associated costs are borne by the Project. Berkeley would arrange for a subcontract for Delta Island Transportation should the Project desire such an arrangement.

The City is willing to cooperate with the Project in the implementation of transportation functions for any mode selected by the Project.

Monitoring and [illegible]

It is proposed that these [illegible] be carried out by a [illegible] competent organization [illegible] Project. [illegible] further proposed that these functions extend to the receiving/initial processing phase as well as the composting phase with specific reference to control of emissions (noise, odor, vibration, [illegible]), [illegible] and quality control.

Proj[illegible]

Overall responsib[illegible] [illegible] proposed [illegible] the Project Action Committee with the consultants in a structure determined by the Project. The City of Berkeley is willing to enter into a management contract with the Project for those administrative responsibilities deemed mutually desirable.

Community Support

The City of Berkeley [illegible] support [illegible] plementation of the Demonstration Project. [illegible] lat[illegible] interested community organizations both in the formation of the joint powers agency and in the development of this proposal document this support. Berkeley offers an unmatched array of public and private organizational resources in the fields of ecology, environmental management, recycling of waste materials, education, research, and technical expertise through local organizations and institutions. We believe that the importance of such supportive resources should not be underestimated as a factor in the successful outcome of the Demonstration Project.

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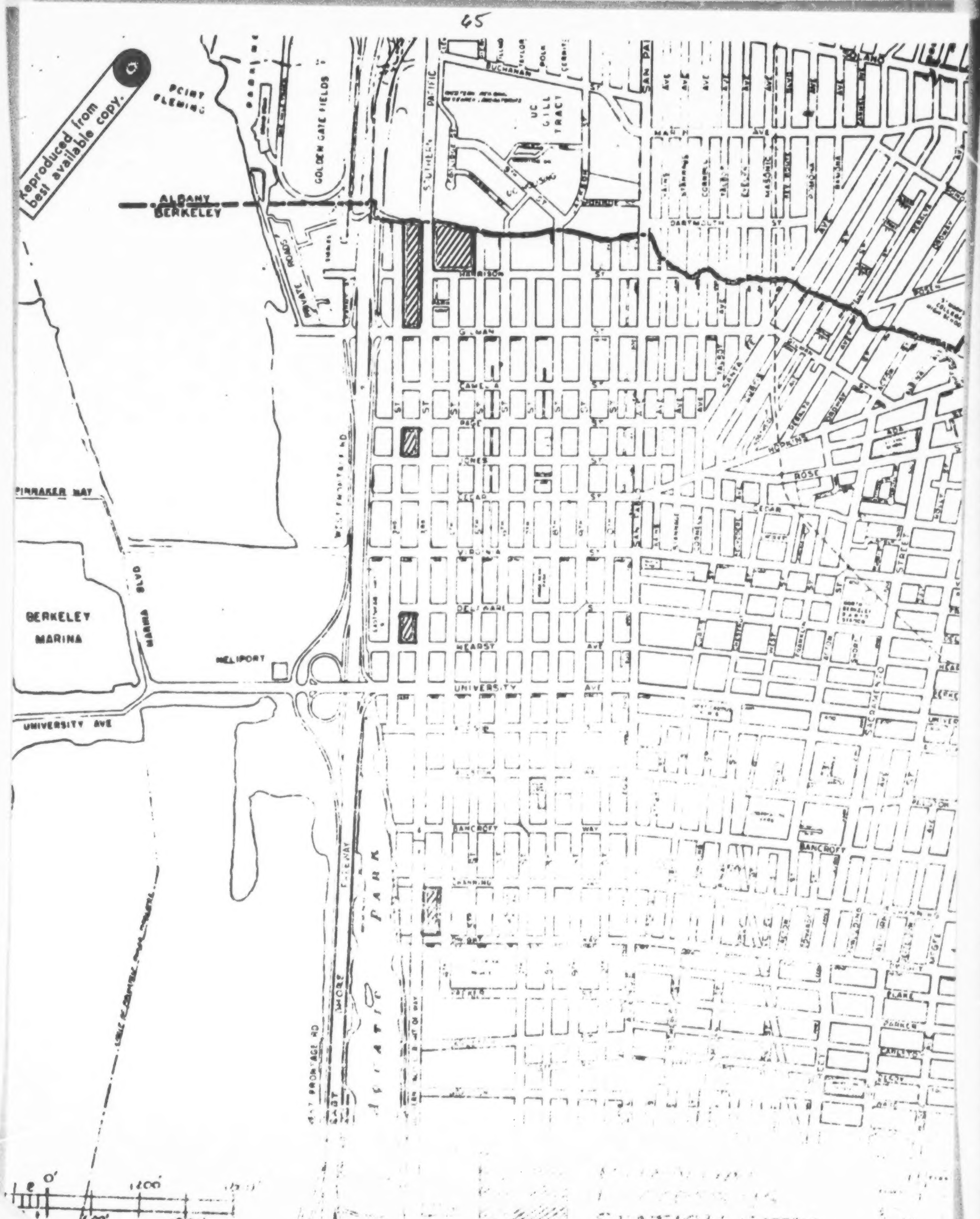
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BERKELEY
STATION SITES

OAKLAND SCAVENGER COMPANY

2601 PERALTA STREET • OAKLAND, CALIFORNIA 94607
Telephone 465-2911

September 14, 1974

Mr. R. C. Gagley
Director of Services
City of Berkeley
Berkeley, Calif. 94705

Dear Mr. Gagley:

We are writing to you in reference to your inquiry of September 7, 1973, regarding supplementing your refuse supply to provide 200 tons per day to the Bay Delta Resource Recovery Demonstration Project.

We can readily divert 50 or more tons per day to the Berkeley landfill site for this project at no cost to the City. These materials would be from our regular residential route refuse collections from cities adjacent to Berkeley.

Kindly give us adequate advance notice of your requirements.

If you have further questions, please contact Mr. Lou Schmitz of this office.

Very truly yours,

OAKLAND SCAVENGER COMPANY

Joe Biasotti
Vice-President

JB;ym

RECEIVED
OCT 17 1973
ASSOCIATION OF
BAY AREA GOVERNMENTS

October 11, 1973

Mr. Fred Maggiora, Chairman
Action Committee for the Bay Delta
Resource Recovery Demonstration
c/o ABAG
Hotel Claremont
Berkeley, CA 94705

Dear Mr. Maggiora:

Subject: Supplying Sewage Sludge for the Bay Delta Resource Recovery Demonstration

This letter will confirm statements by Mr. Anton, the District's representative to the Action Committee, that the District will furnish and deliver an average of from 5 to 25 tons per day (including weight of solids and water) of digested sludge that has been dewatered to about 25 per cent solids. We understand that the sludge is to be delivered in full truck increments of about 25 tons each during the normal work week to the demonstration composting site which is expected to be located along the Berkeley waterfront. We further understand that the sludge may be needed for the entire three-year Demonstration period starting as early as April, 1975 and ending by April, 1978. Under these conditions, the District will furnish and deliver, upon reasonable notice, dewatered sludge at no cost to the Demonstration.

We are aware of the possible need for the District also to furnish a comparable amount of dewatered sludge to a composting site located in northeast South San Francisco. Although it appears that the District may be able to do this at no additional cost, any commitment on our part will depend on the specific arrangements and contractual agreement with the sludge disposal contractor at the time the sludge is required.

We compliment the Action Committee for its work to date and wish it success in its efforts to secure project financing.

Very truly yours,

John H Harnett

EBMUD
1923

RECEIVED SEP -4 1973

MEMBER
Board of Supervisors

DIANNE FEINSTEIN

September 4, 1973

Bay Delta Resource Recovery Committee
Association of Bay Area Governments
Hotel Claremont
Berkeley, California 94705

Dear Sirs:

This is to transmit copies of the Board of Supervisors' resolution declaring San Francisco's interest in participating in the Bay Delta Resource Recovery Demonstration.

In addition, under separate cover, Mr. Myron Tatarian, Director of Public Works, is transmitting a letter which provides answers to questions contained in the July 3, 1973 communication from Mr. Russell Faure-Brac.

A meeting was held with Mr. Sutfin and Mr. Lathrop of Southern Pacific on Monday, August 27. Unfortunately, I was not able to be present at the meeting but Chairman Fred Maggiora has informed me that Southern Pacific has indicated willingness to negotiate a lease on the three or four acres in Brisbane directly adjacent to the transfer station.

It is my hope that the resolution from the Board of Supervisors and Mr. Tatarian's letter satisfactorily indicates San Francisco's interest and willingness to participate in the Bay Delta Resource Recovery Demonstration Project.

Sincerely yours,

Dianne Feinstein

SUPERVISOR DIANNE FEINSTEIN

DF/jre
cc: Mr. S. Myron Tatarian
Enc: Board of Supervisors Resolution
August 28, 1973 letter to Mr. Sutfin from Fred Maggiora

FILE NO.____________ RESOLUTION NO.____________

DECLARING SAN FRANCISCO'S INTEREST IN PARTICIPATING IN THE BAY DELTA RESOURCE RECOVERY DEMONSTRATION

WHEREAS, The Bay Area is about to embark on a unique demonstration program in solid waste management by attempting to implement the so-called SPUR-ABAG study prepared by the San Francisco Planning and Urban Renewal Association in 1971; and

WHEREAS, This program involves the disposal of the Bay Area's solid wastes by using them to reinforce weak and unstable leavees in the Sacramento-San Joaquin Delta; and

WHEREAS, The demonstration will seek to solve a number of environmental problems simultaneously, including the disposal of refuse sewage sludge and dredger spoils; the recovery of resources for reuse by industry; the reinforcement of levees in the Delta; the improvement of the characteristics of agricultural soil; the reduction of water pollution from Delta island water intrusion; and the reduction of air pollution from windblown peat soil; now therefore, be it

RESOLVED, That this Board of Supervisors does indicate its interest in participating in the demonstration program involving the disposal of 100 tons of composted solid waste material per day for a three-year period, and to obtain data, including costs, to determine the feasibility of the SPUR-ABAG plan for the Bay Region.

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

-IVED SEP -4 1973

OFFICE OF THE
DIRECTOR OF PUBLIC WORKS

September 4, 1973

260 CITY HALL
SAN FRANCISCO
CALIFORNIA 94102

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Bay Delta Resource Recovery
Demonstration Project

Mr. Russell Faure-Brac
Environmental Impact Planning Corporation
319 - 11th Street
San Francisco, California 94103

Dear Mr. Faure-Brac:

Your letter of July 3, 1973 relative to the Bay Delta Resource Recovery Demonstration Project addressed to Supervisor Feinstein has been referred to this department for reply.

The contractual relationships existing between the City and County of San Francisco and the two scavenger companies, the Sanitary Fill Company and the City of Mountain View make definitive answers to the questions posed in your letter extremely difficult. Nevertheless, I will attempt to provide as complete answers as possible under the circumstances, which answers were for the most part obtained from the operators of our collection and disposal systems.

In answer to the specific questions contained on page 3 of your letter:

1. 200 tons per day (1000 tons per week) of residential wastes can be delivered to the Transfer Station and thence to a composting facility (if in close proximity to the Transfer Station) over a 3 year period at no cost to the Project.

2. 20 tons per day (100 tons per week) of digested sewage sludge solids could be delivered to the composting facility over a 3 year period, but the present composition of San Francisco's sewage sludge has a high water content, and perhaps 100 tons of this sludge would have to be delivered to produce the required 20 tons per day of sewage sludge solids.

3. The City of San Francisco does not have three acres of land that could be used for a composting facility. The scavenger companies have indicated that perhaps they could buy or lease the required three acres. They have indicated the possibility of leasing land just south of their Transfer Station. The scavengers would expect compensation for the land, whether purchased or leased.

4. The scavenger companies are actively involved in resource recovery of solid wastes, principally regarding newspapers, corregated paper and ferrous metals. Their plans are to expand the resource recovery facilities to include additional materials.

5. The scavenger companies have expressed an interest in offering a package plan for the supply of refuse and sludge, operation of a composting facility, transporting the compost to the Delta, and in addition, operating the landfill area at the Delta. In effect, the scavengers' offer would be conveyed through the City of San Francisco.

The following comments are offered on the ten considerations included in your letter:

1. No comment.

2. The City of San Francisco, through its scavenger companies, is physically ready now to deliver residential refuse and sludge to the demonstration project. It is not possible to know the time required to negotiate an agreement for the demonstration between all the interested parties.

3. The supply of materials would be dependable, and alternate disposal of the material would be available in the event the composting operation should be halted for a period of time.

4. It would be physically possible to expand the supply of material for the demonstration, but there would be contractual limitations as to the quantity of material that could be withheld from the existing landfill area.

5. A composting plant could be continued to be used as a composting plant after the demonstration was over, assuming that the need for a composting facility existed after the demonstration project had ended.

6. A spirit of cooperation exists between the independent parties that would participate in the demonstration.

7. The composting plant serves one function of resource recovery. The City, through its scavenger companies, is actively involved in other aspects of resources recovery.

8. The San Francisco location would offer a good test of the regionality of the demonstration.

9. The demonstration would possibly extend the life of the current landfill operations, but there could be contractual problems involved under the landfill agreement.

10. There is a high level of interest in the demonstration on the part of the Board of Supervisors, the scavengers companies and, I would assume, on the part of the citizenry at large.

If you wish further information please let me know.

Very truly yours,

SM Tatarian

S. M. Tatarian
Director of Public Works

MEMBER
Board of Supervisors

DIANNE FEINSTEIN

September 25, 1973

Councilman Fred Maggiora
Chairman, Association of Bay Area Governments
Bay Delta Resource Recovery Project
% Hotel Claremont
Berkeley, California

Dear Mr. Chairman:

The purpose of this letter is to request reconsideration of the September 19th decision to accept Berkeley as the Demonstration City in the Association of Bay Area Governments Bay Delta Resource Recovery Project and also to request reconsideration of the action setting July, 1974 as the target date.

San Francisco had secured a tentative commitment from Southern Pacific to lease four (4) acres of land directly adjacent to the transfer station for the purpose of building a composting facility. Unfortunately, directly prior to the meeting, Southern Pacific indicated that previous master plan commitments forced withdrawal of their offer. Since then, Sunset Scavengers and Golden Gate Disposal has indicated that they would be willing to lease up to five (5) acres of land at $1.00 per year for the purpose of this project. (see attached)

San Francisco is now prepared to proceed immediately as the demonstration City. Because of our ability to provide the necessary land and the fully equipped transfer station which includes grinding and magnetic separation of ferrous metals, San Francisco is ideally suited for selection.

In summary, we request reconsideration of the selection of the demonstration city and also of the action setting the target date.

Thank you and warmest regards.

Sincerely yours,

SUPERVISOR DIANNE FEINSTEIN

DF/bm

Sunset Scavenger Company

From the office
of the
President

Leonard D. Stefanelli

September 24, 1973

Honorable Dianne Feinstein
San Francisco Board of Supervisors
235 City Hall
Grove and Van Ness Avenue
San Francisco, California 94102

RE: San Francisco Bay-Delta Resource
Recovery Demonstration Project

Dear Supervisor Feinstein:

As per our conversation, I am enclosing the additional information you requested, regarding the many advantages to the above mentioned project, if this system is in fact integrated into the existing San Francisco Solid Waste disposal program.

I will only attempt to outline the more obvious advantages (physically and financially) to the program, if San Francisco is in fact accepted as the participating City.

I would also like to take a brief moment to again remind you that San Francisco is presently operating, and has operated for almost three years, the largest and most comprehensive solid waste system in the United States today, therefore the opinions stated in the memo, are not through speculation, but through a comprehensive knowledge and more than 50 years of working experience, in the field of "Solid Waste Management". Therefore, in my humble opinion, we are extremely qualified to make comments and judgments in these matters.

In our opinion, the City of San Francisco should be reconsidered as the primary city to participate in the Bay Deltà Project for the following reasons:

1 - San Francisco has already in operation, one of the most advanced and largest solid waste processing facilities in the world, receiving almost 2500 tons of waste per day, with a total capacity of some 5000 tons per day, if necessary.

2 - The station is located on the San Francisco-San Mateo County line, therefore, from a geographical point of view is ideally located to incorporate a truly "regional" system of refuse disposal, is deemed to be feasible.

3- Sunset Scavenger Company and Golden Gate Disposal Company have in their possession five acres (or more) of land that is adjacent to deep water bay channel in San Mateo County, but within the immediate area of the Transfer Station, that can be utilized for the actual "composting phase" of the project. Cost for the land, under a lease basis would be minimal during the term of the development period.

4 - The San Francisco System already has in operation, a proven (in house) waste grinder and magnetic separator (ferrous metal extractor) that has a capacity of more than 100 tons per hour.

Total investment (private capital)in just the Transfer Station, Grinder, Magnetic Separator, related equipment and land, exceeds three million dollars.

5 - San Francisco receives and processes more than 2500 tons of mixed waste per day, of which at least 1100 tons can be considered or classified " residential". We also have the ability to "sort" this class of refuse from the balance of the material received.

Therefore, we have more than enough material and the ability to supply the "desirable waste" more suitable for this type of project than any other City being considered.

7 - There is more than sufficient area adjacent and near the existing transfer facilities for construction of the building and equipment needed for the secondary processing facilities, and will be made available for minimal costs for the duration of the project.

8 - We have received a CONTRACT GRANT from the Environmental Protection Agency (EPA) to do the system design work on a secondary resource recovery phase, that would re-grind the refuse into a finer density, a size desirable for air classification, thus providing a material compatible to the proposed project.

9 - Because of the fact that the existing solid waste processing facilities are already in operation, and "Phase I" of the resource recovery system is also in operation, and "Phase II" was re-considered and accepted as the participating City for this program, the project would in fact be implemented and proven almost two years sooner than any other city considered, once the necessary financing had been arranged.

Although there are many other reasons that could be cited as to why San Francisco is,in our opinion, "the best City for this project", but the most important, is the fact, that it is an on-going system . Proven, with almost three years of uninterrupted operation, and has almost 55% of the required equipment and facilities needed for the Bay-Delta Project, therefore, to duplicate this system eleswhere, would only "duplicate" the expenditures required, and in some cases, on unproven equipment and design.

As a final statement of fact, most people do not understand that a good "collection" system of solid waste is only as good as the "disposal" system.

In simple terms, it means that if you cannot "dump" the refuse you have already collected in the collection vehicles, you can not continue to collect any additional refuse, therefore, a breakdown in refuse collection will occur, and the material will stay upon the premises of the people being served.

This problem can and will certainly occur if there is a failure in any of the equipment being considered for this project, and most certainly, there will be other shut downs for modifications, changes in operating proceedures, etc.

In either case, I cannot help but notice in the plans, that there have been no provisions for standby equipment, or suitable storage areas for untreated waste, if there should be a stoppage of any kind in the system, and this fact alone, could have a disastrous effect on the "collection" aspects of any City who was participating in the project, except the City of San Francisco because these "safe guards" are already incorporated in our existing system.

In simple terms, because of these considerations already implemented in our system, there is no need for concern regarding the work or system stoppage for any reason. This fact may or may not mean anything to most people, but it is one great responsibility that the engineers and project managers will not have to concern themselves with, if there is a shutdown for any reason, and I can not emphasize the importance of this one asset alone, which will not be available under the present plans.

As I stated to you, I personally have some reservations about certain areas of the proposed programs, but this concern is more than offset when I visualize how much knowledge and experience will be developed through the research and development phases of the program, and coupled with the experienc and knowledge already in existence and built into San Francisco's world famous operating solid waste system, the advantages for all the people of the nation becomes obvious and to numerous to mention.

We urge that the issues and reasons as set forth in this memo be re-submitte to the Bay Delta Action Committee, so that the City of San Francisco may be re-considered for this important demonstration project, as we sincerely feel that because of the facts outlined in this memo, San Francisco is obviously the most prominent, eligible and best suited City to prove the feasibility of this program.

Sincerely yours,

SUNSET SCAVENGER COMPANY

LEONARD STEFANELLI
PRESIDENT

LS/mm

Also representing:

GOLDEN GATE DISPOSAL COMPANY
SANITARY FILL COMPANY
SOLID WASTE ENGINEERING AND TRANSFER SY

SANITARY FILL COMPANY
FOOT OF TUNNEL AVENUE
SAN FRANCISCO, CALIFORNIA 94124

October 1, 1973

The Honorable Dianne Feinstein, Supervisor
San Francisco Board of Supervisors
Room 235 - City Hall
San Francisco, California 94102

Dear Mrs. Feinstein:

I am writing this letter in response to the request of the Association of Bay Area Government Action Committee and their consultants, Environmental Impact Planning Corporation.

Sanitary Fill Company is prepared to lease five or more acres for one dollar ($1.00) per year, at Sierra Point, City of South San Francisco. This property is adjacent to a shipping channel used by the American Bridge Division of United States Steel. Access to this property is on easement, granted by the California Division of Highway and Southern Pacific Railroad. The property is located east of the Bayshore Freeway, with offshore prevailing wind, and is ideally located for the proposed demonstration composting project.

Sanitary Fill Company is also prepared to supply rough shredded refuse from the L.A. Transfer Recovery System, and sewage sludge in the amount needed by the demonstration, delivered to Sierra Point site at no cost to the demonstration.

If desired, Sanitary Fill Company and its associates are prepared to supply composted waste in the quality specified by the consultants, delivered on a barge at a price to be negotiated.

Sanitary Fill Company is also prepared to supply, to the demonstration, if required, a fine shredded refuse, similar to that produced by the Combustion Power Company, located in Palo Alto. The price for this product will be based upon the additional cost of the fine shredding, and air classifying of the waste if Sanitary Fill Company or its Associates are not processing the waste for the recovery of the aluminum, glass and other non-ferrous metals. If we find that the Recovery System is profitable, we will supply this fine shredded, air classified waste at no cost.

We are now conducting an Economic Feasibility Study for this process with the conjunction of the United States Environmental Protection Agency. We will have an answer to the feasibility of this process in the next four months.

Because of the size of Sanitary Fill's operations and the background it has in waste processing, we feel that we can offer economics to the program that cannot be duplicated by anyone else in the Bay Area.

I hope this offer meets with your approval.

Sincerely yours,

SANITARY FILL COMPANY

LEONARD STEFANELLI
VICE PRESIDENT

LS/mm

cc: Chairman of Action Committee,
  Fred Maggoria
 Wayne Trewhitt
 John Moscone

ZUCKERMAN
MANDEVILLE, Inc.

PRODUCERS OF FINE AGRICULTURAL PRODUCTS
FROM THE SAN JOAQUIN DELTA

Post Office Box 487 • Stockton, California 95201 • Telephone (209) 465-7213

August 15, 1973

Mr. Fred Maggiora, Chirman
ABAG
Hotel Claremont
Berkeley, California 94705

Dear Mr. Maggiora:

Thank you for your letter of July 31, 1973. I will attempt to answer your questions and number them according to your letter.

1. Personal Liability - We will require a $300,000 minimum with a $1,000,000 (blanket) for the agency leasing the land or any of its contractors.

2. Road Repair - Will be roughly $1,000 per mile per year - distance to be measured from Mandeville bridge to site. It could vary from this figure either way, depending on severity of winter rains and number of trucks using roads.

3. We could contribute to experimental farming of area under supervision of UC Extension Service and would only charge out of pocket costs, such as direct labor, seed, fertilizer, fuel and repair parts.

4. Map is enclosed showing various sites that could be used for demonstration. I have picked 5 sites:

    a. #3. and #5. could be used best for barge unloading.

    b. #1. would be most convenient for truck unloading, ease of transportation, inspection, and road maintenance.

5. We would make the site available for a use fee of $50. per acre per year. We would also want an option to be the first recipient of any future materials should the project prove to be a success and the program expanded.

Sincerely yours,

ZUCKERMAN-MANDEVILLE, INC.

By
Alfred R. Zuckerman, President

ARZ:ddc
Enclosure

APPENDIX B

BAY DELTA RESOURCE RECOVERY DEMONSTRATION PROJECT

This is a Joint Exercise of Powers Agreement entered into by various Public Agencies of the San Francisco Bay Delta area under the provisions of the Joint Exercise of Powers Act (Calif. Government Code Sec. 6500-6515).

PURPOSE

Public Agencies entering into this Agreement are supporting a demonstration program for the disposal of solid wastes by using the organic portions of them for land reclamation in the Sacramento-San Joaquin Delta area. This is a pilot project to test the feasibility of one of the more promising options for recovery and beneficial use of the resources contained in solid wastes. It is also an initial step in the development of regional management for solid wastes and resources recovery. This demonstration project relates to the legislative mandate contained in the Nejedly-Z'Berg-Dills Solid Waste Management and Resources Recovery Act of 1972.

Stage 1 of this pilot project is supported by an Environmental Protection Agency grant of $61,800 to the Association of Bay Area Governments and local contribution of $45,000 from public and other participating agencies. Local contributions are allocated as of August 15, 1973 as follows: Environmental Protection Agency grant local match, $20,600; Environmental Impact Planning Corporation Consultant Contract, $12,000; uncommitted, on hand, $10,900; uncommitted, account receivable $1,500. The scope of Stage 1 includes design of management aspects of the pilot project, development of financing and cost allocation plans, consideration of environmental evaluations and organization of an intergovernmental structure to manage this solid waste demonstration program.

Concerned public and other participating agencies have been proceeding with the charges of Stage 1 through an "ad hoc" Action Committee. It is now concluded that Stage 1 can be completed best by these agencies through a formal joint exercise of powers agreement. This will establish an initial structure which can solicit and encourage federal and state grant financial assistance to the project. It will give a formal beginning to the pilot project without requiring the expenditure of any additional funds or commitments by public and participating agencies.

TERMS AND CONDITIONS

1. Definitions

A. Project

All elements of Stage 1 of the Bay Delta Resource Recovery Demonstration Project as delineated in the Grant Application of ABAG to the Environmental Protection Agency including but not limited to design of management aspects of the pilot project, development of financing and cost allocation plans, consideration of environmental evaluations, organization of an intergovernmental structure to manage this solid waste demonstration program.

B. Bay Delta Resource Recovery Demonstration Board (hereafter "Board"):

The agency established by this Agreement shall be known as the Bay Delta Resources Recovery Demonstration Board (hereinafter "Board"). Each public agency executing this agreement shall appoint one member (and alternate) to this Board. Each participating agency shall appoint one member (and alternate) to this Board.

C. Public Agency:

Any agency empowered to execute a joint exercise of powers agreement and as defined in Calif. Government Code Sec. 6500.

D. Donor Public Agency:

Any public agency which supplies raw material for the demonstration project.

E. Participating Agency:

Any semi-public agency not included within the definition of Calif. Government Code Sec. 6500 and any private agency or association invited by a two-thirds vote of the Board to participate in the Project.

2. Cost Estimate and Prorated Shares:

The estimated total cost of the Project is $106,800. The Environmental Protection Agency has made a grant of $61,800 to ABAG for the Project. The local contribution of the public and participating agencies is an estimated $45,000. The contribution of each of the counties, cities with population in excess of 50,000, special districts and participating agencies is $3,000 in cash. The contribution of each of the cities with population less than 50,000 is $1,500 in cash.

Local contributions are allocated as of August 15, 1973 as follows: Environmental Protection Agency grant local match, $20,600; Environmental Impact Planning Corporation Consultant Contract, $12,000; uncommitted, on hand, $10,900; uncommitted, account receivable, $1,500.

The contributions listed above represent the maximum financial commitments to date of public and participating agencies to the Project under this Agreement. Under no circumstances shall the debts, liabilities or obligations of the Board be the debts, liabilities or obligations of any of the parties to this Agreement, and each party's obligation hereunder is expressly limited to the contribution heretofore made to the Project.

3. Bay Delta Resource Recovery Demonstration Board: Its Power, Authority, Responsibilities and Duties:

The Board is established to administer, direct and terminate the Project. The Board shall administer and account for all funds. The Board shall establish its own procedures and do all things necessary to the purpose of this agreement. The Board may make and enter into contracts; employ agents and employees; acquire, hold or dispose of property; incur debts, liabilities or obligations and sue and be sued in its own name.

The Board may establish an Executive Committee consisting of the Board member representing a donor public agency for the Project and five additional Board members. The Executive Committee may be authorized to exercise any powers possessed by the Board. Any action of the Executive Committee may be amended or repealed by a majority vote of all Board members.

4. The Program Advisory Committee

The State and County Solid Waste Management Plans and Resources Recovery Programs mandated by the Solid Waste Management and Resources Recovery Act of 1972 must consider and develop demonstration projects on the recovery of useful resources from solid wastes. The legislation encourages regional solid waste management planning.

The Board, recognizing these goals, shall appoint a Program Advisory Committee composed of the following membership: one representative nominated by the State Solid Waste Management Board; one representative nominated by the State Department of Public Health; one representative nominated by the Boards of Supervisors from each of the following counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Joaquin, Santa Clara, San Mateo, Solano, and Sonoma. County representatives should be selected from among those involved with the County Solid Waste Management Program. Additional members may be added from time to time by a majority vote of the Board.

The Program Advisory Committee shall review the elements of Stage 1 and make recommendations and report to the Board.

5. Restrictions Upon Exercise of Power of Board:

This Agreement is entered into under the provisions of Title 7.3 and Article 1 of Chapter 5, Division 7, Title 1 of the California Government Code. In accordance with section 6509 thereof, the powers to be exercised hereunder shall be subject to the restrictions upon the manner of exercising the powers as are imposed upon the City of Oakland in the exercise of similar powers.

6. Staff:

The Association of Bay Area Governments shall provide the support staff assistance for the Project through its employees and retained consultants, and shall maintain its responsibility under the Environmental Protection Agency Grant to the Association of Bay Area Governments for the Project.

7. Funds, Audit and Accounting Services:

The Treasurer of the County of Alameda, pursuant to Government Code Section 6505.5, is designated to be the depository and to have custody of all project funds. He shall perform the duties specified in Government Code Section 6505.5.

The Auditor of the County of Alameda shall perform the functions of auditor or controller. He shall perform the duties specified in Government Code Section 6505.

There shall be strict accountability of all funds and report of all receipts and disbursements.

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8. Termination

This Agreement shall remain in effect for the period of time the Board determines is necessary to complete programs specified under this Agreement, unless terminated prior thereto by a majority vote of the Board. Any individual public agency may withdraw, but this Agreement shall not be terminated by such withdrawal.

Upon termination, any funds or other property of the Project remaining after payment of all obligations, shall be distributed to the public and participating agencies in proportion to their respective contributions.

9. Reservation to Amend or Supplement Agreement:

The public agencies reserve the right to amend or supplement this Agreement within the scope thereof at any time for any purpose in accordance with the provisions of applicable law.

10. Effective Date of Agreement:

This Agreement may be executed in counterparts and shall be effective upon counterpart execution by ten (10) public agencies.

EXECUTED:

AGENCY: DATE: